SOIL SURVEY OF CLAY COUNTY, INDIANA

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DESCRIPTION OF THE AREA

Clay County, Ind., is located in the southwest quarter of the State. Parke and Putnam Counties bound it on the north, Putnam and Owen Counties on the east, Owen and Greene Counties on the south, and Sullivan and Vigo Counties on the west. The original boundary lines of the county have never undergone any change.

The county has a maximum length from north to south of 30 miles, and a maximum width from east to west of 16 miles. It comprises an area of 361 square miles, or 231,040 acres.

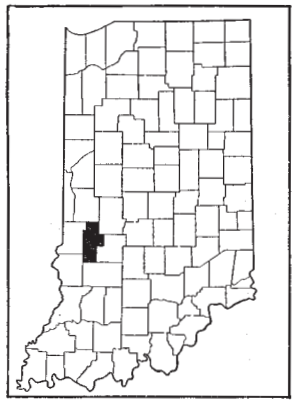

FIG. 41.—Sketch map showing location of the Clay County area, Indiana

Clay County is a part of the Wabash lowlands in western Indiana. The topography is that of a plain, in parts smooth and in others dissected into moderately rolling to hilly country.

Probably the highest elevation in the county is to be found in the northeastern part near Lena. Gannett's Dictionary of Altitudes gives the elevation of this place as 735 feet. Other elevations of considerable height occur southeast of Ashboro and at Middlebury. According to the Handbook of Indiana Geology, the minimum altitude of the county is 505 feet and the maximum is 740 feet above sea level, the average being 625 feet. The maximum local relief is 160 feet.

The first settlement in Clay County was made in the fall of 1818 on the highlands along Eel River. From 1820 to 1825 settlement was made on the hills east of the river, near the present site of Poland. In 1823 Sand Hill, the present site of the town of Middlebury, was settled.

Clay County was organized in 1825 from parts of Vigo, Owen, and Sullivan Counties, nine years after the admission of Indiana to the Union. At the time of the organization of the county the Poland neighborhood was the most populous part of the territory. Bowling Green was selected as the county seat in May, 1825, but the seat of county government was transferred to Brazil on September 9, 1871.

Brazil, now a city of 9,293 inhabitants, is situated in the northern part of the county. It was originally laid out January 4, 1844. It is a thriving business center, and is noted for the manufacture of clay

products. Clay City, in the southern part of the county, is the second town of importance. It has a population of 1,226, and is surrounded by a good farming country. Staunton (population, 642), Knightsville (767), Centerpoint (371), Carbon (572), Cory, Harmony, Coalmont, Lena, Saline City, Perth, Howesville, and Turner are railroad towns and villages. Bowling Green (population, 273), Poland, Ashboro, Cardonia, and Hoosierville are trading centers off the railroad. According to the 1920 census, the population of Clay County is 29,447, of which 68.4 per cent is classed as rural. The density of the rural population averages 55.8 persons per square mile.

All parts of the county, except the extreme eastern section, are well supplied with transportation facilities. The Cleveland, Cincinnati, Chicago & St. Louis Railway (main line of the Big Four) crosses the northern part of the county diagonally northeast and southwest. This road, originally known as the Indianapolis & St. Louis Railroad, was built in 1869–70.

A branch line of the Big Four, formerly the Evansville, Indianapolis & Terre Haute Railway, connects Worthington in Greene County with the main line at Terre Haute, passing through Clay City, Saline City, and Cory. The St. Louis and Indianapolis division of the Pennsylvania lines traverses the area from east to west, passing through Brazil. This road was constructed as the Terre Haute & Richmond in 1851 and was the first railroad in Clay County. A branch connects Centerpoint with the main line at Knightsville. Another branch connects Brazil with Terre Haute, passing through Turner and Staunton. The Central Indiana Railway extends north from Brazil through Carbon to Anderson. The Chicago & Eastern Illinois Railroad connects Brazil with Chicago. The Chicago, Indianapolis & Louisville Railway enters the county east of Clay City, passes through Clay City, and southward through Howesville. This same line crosses the extreme southeast corner of Washington Township. The Chicago, Milwaukee & St. Paul Railway crosses the southwest corner of the county, passing through Coalmont.

In addition to the steam roads,, the Terre Haute, Indianapolis & Eastern Traction Co.'s line (electric) passes through Brazil and extends to Richmond, via Indianapolis.

The dirt roads of the county are, as a whole, in good condition. The main thoroughfares are surfaced and the mileage of improved highway is increasing each year. The National Old Trails Road, an interstate highway from east to west, crosses the northern part of the county, passing through Harmony, Knightsville, Brazil, Williamstown, and Cloverland. It was surveyed in 1832, and was one of the important pikes of the early days. It is now a paved highway across Clay County.

The chief markets outside the county are Terre Haute, Indianapolis, Chicago, and St. Louis. From Brazil to Terre Haute is 15 miles; to Indianapolis, 57 miles; to Chicago, 183 miles; and to St. Louis, 180 miles. Considerable produce is hauled by auto truck to Terre Haute.

The county is well supplied with schools. The towns and villages have good high schools, and the schools of some of the rural districts have been consolidated.

CLIMATE

There is no Weather Bureau station within Clay County, but the records of the stations at Rockville, Parke County, and at Farmersburg, Sullivan County, are fairly representative of the local climatic conditions.

The annual rainfall, as recorded at the Rockville station, ranges from 29.53 inches in the driest year on record (1894) to 48.04 inches in the wettest year (1898). At the Farmersburg station, for the driest year (1901) 26.24 inches are recorded and for the wettest year (1915) 46.76 inches. The mean rainfall, based on records covering many years, is 38.01 inches and 37.19 inches at Rockville and Farmersburg, respectively.

The heaviest rainfall occurs normally during the spring and summer months. The mean rainfall at Rockville for the three spring months is 10.91 inches and for the summer months 10.63 inches. The Farmersburg station reports average rainfalls of 10.70 inches and 10.73 inches, respectively, for spring and summer. The snowfall is very variable from year to year, the average depths being 17.8 inches at Rockville and 19.2 inches at Farmersburg.

The mean annual temperature at Rockville is 52.3° F. The mean temperature for the winter is 29.8°, with extremes ranging from −22° to 69°. The mean temperature for the spring is 51.6°, and for the summer it is 73.1°. The maximum temperature recorded is 106° in August. At Farmersburg the maximum temperature is 110°, and the minimum —23°.

The average date of the last killing frost in the spring at Rockville is April 26, and of the first in the fall October 10, giving an average growing season of 167 days. The latest date of killing frost in the spring is May 21, and the earliest in the fall, September 16. At Farmersburg the average date of the last killing frost in the spring is April 20, and the earliest in the fall October 16, giving an average growing season of 178 days. The latest recorded date of killing frost in the spring is May 10, and the earliest in the fall September 16.

The following tables give the mean and extreme monthly, seasonal, and annual temperatures and precipitation as recorded at the Weather Bureau stations at Rockville and Farmersburg:

Normal monthly, seasonal, and annual temperature and precipitation at Rockville, Parke County

[Elevation, 722 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1898)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	31.5	68	−15	2.46	2.95	1.32	3.5
January	28.7	69	−20	2.67	2.29	4.18	4.8
February	29.1	69	−22	2.32	2.95	1.74	5.2
Winter	29.8	69	−22	7.45	8.19	7.24	13.5

Normal monthly, seasonal, and annual temperature and precipitation at Rockville, Parke County—Continued

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1898)	Snow, average depth
	°F	°F	°F	*Inches*	*Inches*	*Inches*	*Inches*
March	40.1	85	−3	3.56	3.73	8.95	3.5
April	52.4	88	19	3.43	2.66	2.59	.2
May	62.4	96	28	3.92	3.34	3.54	T.
Spring	51.6	96	−3	10.91	9.73	15.08	3.7
June	71.3	102	34	3.80	2.00	6.18	.0
July	75.0	105	43	3.70	1.40	2.12	.0
August	73.1	106	40	3.13	2.23	3.61	.0
Summer	73.1	106	34	10.63	5.63	11.91	.0
September	67.3	103	26	3.15	2.47	6.12	.0
October	54.8	92	18	2.51	.75	4.37	T.
November	42.3	77	2	3.36	2.76	3.32	.6
Fall	54.8	103	2	9.02	5.98	13.81	.6
Year	52.3	106	−22	38.01	29.53	48.04	17.8

Normal monthly, seasonal, and annual temperature and precipitation at Farmersburg, Sullivan County

[Elevation, 776 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1901)	Total amount for the wettest year (1915)	Snow average depth
	° F.	° F.	° F.	*Inches*	*Inches*	*Inches*	*Inches*
December	32.3	69	−16	2.71	4.00	4.96	3.1
January	30.4	77	−22	2.31	.79	2.94	5.6
February	29.3	75	−23	2.28	.50	1.44	6.0
Winter	30.7	77	−23	7.30	5.29	9.34	14.7
March	42.4	88	−2	3.58	3.30	1.11	4.0
April	53.0	88	22	2.90	2.51	1.17	.1
May	64.4	94	20	4.22	1.24	7.58	.0
Spring	53.3	94	−2	10.70	7.05	9.86	4.1
June	71.1	100	38	3.51	5.91	2.81	.0
July	76.1	110	48	3.91	.69	6.57	.0
August	74.5	103	41	3.31	.86	7.55	.0
Summer	73.9	110	38	10.73	7.46	16.93	.0
September	68.7	105	21	3.34	1.44	5.31	.0
October	56.5	93	22	2.68	3.42	1.49	T.
November	44.2	80	7	2.44	1.58	3.83	.4
Fall	56.5	105	7	8.46	6.44	10.63	.4
Year	53.6	110	−23	37.19	26.24	46.76	19.2

The accompanying sketch map of Indiana (Fig. 42), which is based on data taken from the Purdue Handbook of Agricultural

FIG. 42.—Sketch map showing climatic data

Facts, shows the position of Clay County in relation to some of the climatic conditions which are of agricultural significance.

AGRICULTURE

The early history of agriculture in Clay County dates back to 1818, when the first settlement was made on the highlands along the Eel River. By 1825 a number of small settlements had become established in different parts of the county, the most populous being near the present town of Poland. The development of agriculture was, however, very slow, for the reason that all the earlier homesteads were located only on land having good natural drainage, such areas being heavily forested with oak, beech, hickory, elm, sugar maple, ash, walnut, and other hardwoods.

At first small fields were cleared and planted to corn and potatoes. Gradually more attention was paid to the growing of wheat, rye, oats, buckwheat, and vegetables. Wheat was generally the second crop grown on newly broken ground, but in some cases corn was grown for two or three years before the land was sown to wheat. The first wheat was planted in the fall of 1827. The early settlers also produced some flax and wool, from which they made their clothing.

At a later time, during the height of the westward migration, large numbers of people, crossing this section of the State, created a market for all foodstuffs. Prior to the completion of the National Old Trails Road in 1835 most of the grain produced had to be consumed at home. The building of this highway and the Wabash & Erie Canal, which was opened for navigation May 1, 1850, greatly stimulated all business activities. Direct communication with the Ohio River, afforded by the canal, was especially favorable to agricultural development. Products hitherto without a market could now be produced in abundance.

By 1851 the first railroad had reached the territory, and soon afterwards others were constructed. Since the railroads afforded better and more rapid transportation facilities, canal transportation was abandoned.

Gradually the productive bottom lands were cleared, drained, and placed under cultivation. Many improvements followed rapidly.

Clay County has long been noted for its coal and clay products. The first carload of coal was shipped out of the county in 1852, and coal production reached its height about 1900 to 1906. The manufacture of clay products, consisting of building and paving brick, sewer pipe, conduits, silo tile, flue linings, and other products, is a very important industry at the present time, and production is on the increase.

The farms, particularly those in the coal-producing sections, were neglected during the more prosperous years of coal production, when returns from leasing the mineral rights were far in excess of the profits obtained from farming. The wages paid by the coal companies were attractive, and many erstwhile farmers found "wagon mines" more remunerative than farms. Although these conditions may still exert some influence, they no longer interfere with the proper development of farming. There are still a few persons who mine coal in the winter and pursue farming during the summer months.

At the present time the agriculture of Clay County consists of the growing of general farm crops for sale and for home use, dairying, hog raising, the raising of dairy and beef cattle, and, to a limited extent, the feeding of beef cattle. Corn, hay, wheat, and oats are the major crops, named in the order of rank, on the basis of acreage. The table following gives the acreage and production of these four crops, as reported in the last five censuses, 1880, 1890, 1900, 1910, and 1920:

Acreage and production of the principal crops of Clay County 1879, 1889, 1899, 1909, and 1919

Year	Corn		Hay		Wheat		Oats	
	Acres	*Bushels*	*Acres*	*Tons*	*Acres*	*Bushels*	*Acres*	*Bushels*
1879	31,917	964,658	14,913	14,800	28,174	403,652	6,367	134,304
1889	31,947	790,981	30,197	31,826	13,950	165,011	11,836	215,248
1899	42,246	1,346,160	24,748	29,985	23,086	267,590	12,309	315,470
1909	38,380	941,679	32,057	38,773	16,597	226,522	12,939	296,597
1919	40,776	1,281,732	24,419	25,527	30,319	407,549	16,278	329,622

The salient facts brought out by this table are: (1) An increase in the total area occupied by the four crops, from 81,371 acres in 1879 to 111,792 in 1919; (2) the erratic fluctuations of the hay and wheat acreages; and (3) the increase in the acreage of oats.

Corn reached its greatest acreage and production in 1899, hay in 1909, and wheat in 1919. The timothy acreage has always been large. In 1909 it was 24,551 acres, or approximately the acreage devoted to all tame or cultivated grasses as reported for the year 1919. Before 1909 the timothy acreage was included in the acreage of all tame or cultivated grasses. Most of the timothy hay is used within the county to feed work animals and cattle, and a small part of it is shipped to outside markets.

The census of 1920 reports 1,275 acres in clover, with a production of 1,394 tons. Clover is being introduced more and more into the rotations. It is generally sown with wheat as a nurse crop, although a considerable acreage is sown with timothy. Some farmers sow clover in February, March, or April on ground seeded the preceding fall to timothy, either by broadcasting or drilling with a special drill. In addition to the timothy and clover grown alone, the census of 1920 reports 4,201 acres devoted to a mixture of these crops. Some of the hay produced on the bottom lands is shipped outside the county. Alsike clover is grown, but not extensively. It may be grown successfully on land only moderately well drained.

Alfalfa is recognized as a valuable feed for all kinds of live-stock and as an excellent soil renovator. It has been grown for a number of years, but until recently the acreage has been very small. Alfalfa is grown almost exclusively on the bottom lands, where it is steadily becoming more popular. One of the first alfalfa fields in the county is said to have thrived for 14 years before being crowded out by blue grass. In the census of 1920 a total of 199 acres is reported, with a production of 367 tons of hay. Seeding is usually done in the spring with oats as a nurse crop. A mixture of 1½ bushels of oats and 6 pounds of alfalfa seed per acre is sown.

Some farmers prefer to sow alfalfa in the fall, believing that a better stand is obtained and that weeds are less troublesome. Three cuttings are obtained each year, the first two cuttings yielding 2 tons per acre at each cutting and the third from 1 to 1½ tons.

Corn is the most widely grown crop in the county. It is grown on practically every farm, in fields ranging from a few acres to 50 acres or more. The larger fields are located on the river bottoms. In 1899 the corn acreage practically equaled the combined acreage of wheat and oats. Large quantities of corn are husked and fed to hogs, but some is ground and forms a part of the grain ration for dairy cows.

A large quantity of the stover is shredded and stored in barns, and a considerable acreage is devoted to corn for silage. The southern part of the county produces more corn than it consumes, but north of Saline City the production is generally insufficient to meet local demands. Thus considerable quantities of ground feed are shipped into this northern section. Reid Yellow Dent is the variety most commonly grown, since it is more certain to mature. For this reason it is considered the best variety for the bottom lands. Iowa Silvermine and, to a less extent, Boone County White are the white varieties grown, chiefly on the upland soils.

Wheat is the principal cash crop. A small part of the wheat is used locally, but the bulk finds its way to outside markets. There are several elevators in the county. Wheat is sown in the fall on corn land or on land used the preceding year for oats. When corn land is used, the seed is sown between the corn rows with a narrow, one-horse drill. Ground that has lain fallow or has been in oats the preceding season is plowed and harrowed. Fultz, Rudy, and Poole are the varieties commonly grown. A small part of the straw is baled and sold.

Approximately half of the farmers of Clay County grow oats. The grain for the most part is fed on the farms, but occasionally a part of the crop is sold. The oat straw is nearly always fed to livestock on the farms. A small acreage is cut green for hay. Chiefly white oats are grown, but the varieties are not pure.

In addition to the important crops, there are a number of minor crops grown to a greater or lesser extent. Rye, barley, soy beans, cowpeas, buckwheat, and sorgo (sweet sorghum) are grown locally in small patches. Sorgo sirup is manufactured for home use and for the local markets. There are a few public mills to which the grower may take his cane and have the sirup made for 35 cents a gallon. The yield of sirup ranges from 100 to 200 gallons per acre, and the price obtained for the finished product is from $1 to $1.25 per gallon. Early Orange and Honey Cane are the principal varieties.

Potatoes, vegetables, and small fruits, consisting of strawberries, blackberries, raspberries, currants, and gooseberries, are grown for home use and for the local markets. Tomatoes are grown chiefly for the canning factories located at Brazil and Clay City. Pimentos are handled exclusively by one of the Clay City plants.

The census of 1920 reports 48,390 apple trees, or less than half the number reported in 1900. Apples have been grown commercially in Perry Township for a quarter of a century, but insect and fungous enemies have of recent years proved a very serious menace

to the industry. Brown rot, San Jose scale, and, to a lesser extent, the codling moth are the most troublesome pests.

During the last few years considerable attention has been given to reestablishing commercial apple growing, not by planting new orchards, but by renovating old, neglected, and diseased trees. An orchardist, with headquarters at Cory, is properly equipped with modern apparatus for carrying on the work, and is at present caring for approximately 10,000 trees. The work is usually done on a percentage basis, and orchard owners find the arrangement very satisfactory and profitable.

The leading varieties are Stayman Winesap, Gano, Baldwin, Delicious, and Grimes Golden. Other varieties are Rome Beauty, Henry Clay, Yellow Transparent, Pewaukee, and Arkansas (Mammoth Black Twig). Apples do best on the Gibson, Vigo, and Cory silt loams. Peaches are not grown extensively, on account of their susceptibility to winterkilling. Pears are usually short lived. Cherries do very well.

Of the livestock interests, the most important is hog raising and feeding. According to the census reports, Clay County had 30,000 hogs in January, 1920. About 75 per cent of the purebred herds are of the Poland-China breed, big type. The other breeds are the Duroc-Jersey, Ohio Improved Chester, and Berkshire.

There are 60 breeders of purebred hogs in the county. There are no scrub boars. The raising of hogs is well distributed throughout the county, and the industry is increasing. Indianapolis is the main hog market.

Dairying is now regarded as one of the principal industries. It has been greatly expanded during the last few years. In 1899, according to the census, the value of dairy products, excluding those used in the home, was $84,906; in 1909, $177,965; and in 1919, $432,363, an increase of nearly 143 per cent during the last decade.

The majority of the dairy cows are purebreds, and the proportion of such cows is gradually increasing. Dairying is the chief source of income on a number of farms, and on a great many more it is an accessory source of income. The average farmer keeps from 7 to 10 dairy cows, the product sold being cream. The separated milk is fed to hogs and calves. The large creamery at Brazil uses over 60 per cent of the cream produced in the county, in addition to large quantities produced in the surrounding country. Indianapolis and Terre Haute are also markets for cream. A considerable quantity of cream produced in the southern part of the county is sold in Worthington. Some of the dairies produce milk or cream exclusively, and a few others produce cows and young animals.

The production of purebred beef cattle and the raising of dairy cattle have assumed about equal importance. The beef cattle—Shorthorn, Hereford, and Angus—are sold to local buyers or to breeders in Indiana or other States. Grades and calves are sold to buyers who ship them to Indianapolis. From 10 to 15 per cent are shipped to Terre Haute.

Sheep raising is not especially important and is not specialized, but flocks of from 15 to 50 or more are found on many farms, mainly in the central part of the county. The Shropshire and Hampshire

breeds predominate. Most of the sheep or lambs are shipped to Chicago.

The raising of poultry is an important source of income on nearly every farm. In 1919 the combined value of fowls and eggs was $532,519. The produce, above that required for supplying the home needs, is sold to dealers who supply the local demands and who ship to outside markets. Among the flocks are some purebred Barred and White Plymouth Rocks, and Leghorn chickens.

Crop rotation is generally practiced by the farmers of Clay County. The rotation usually practiced is as follows: Corn, 1 year; oats, 1 year; and wheat, 1 year—grass and clover being seeded in the wheat. Grass is allowed to occupy the land from 1 to 4 years. Legumes, in addition to alfalfa and clover, are being grown more extensively, and on a few farms soy beans and cowpeas have been grown with good results. These legumes aid materially in maintaining the soil supply of organic matter.

The use of commercial fertilizers has rapidly increased during the last few years. The expenditure for fertilizers in 1919, according to the census, was $81,044, or an average of $73.68 on each of 1,100 farms reporting. Commercial fertilizers are used on 45.5 per cent of the total number of farms. This expenditure is an increase of $69,686 over that reported for 1909. A fertilizer analyzing 2 per cent ammonia, 12 per cent phosphoric acid, and 2 per cent potash is commonly used. Wheat is usually given an application of from 100 to 300 pounds per acre, and corn from 100 to 200 pounds. Sixteen per cent acid phosphate is used more extensively than complete fertilizers.

The total number of farms in the county in 1920 was 2,414, comprising 88.5 per cent of its area. The average size of the farms is 84.7 acres, the size ranging from small holdings, as near towns and along the electric railway, to several hundred acres. There are a dozen or more farms of over 500 acres and a few estates of 1,000 acres or more on the Eel River bottoms.

In 1920, 73.7 per cent of the farms were operated by the owners, 25.4 per cent by tenants, and 0.9 per cent by managers. Ordinarily farms are rented for one year. Cash rent, which is uncommon, ranges from $3 to $8 an acre. When a farm is rented on shares the owner generally receives half of all the crops, the tenant furnishing both livestock and tools. Where the owner furnishes the land, livestock, and machinery the tenant gives two-thirds of the crops.

The census reports laborers employed on 958 farms in 1919, and a yearly average of $228.90 per farm paid out for help. All of the laborers are white and generally efficient. Harvest hands are paid from $3 to $4 a day. Farm hands hired by the month receive from $30 to $60, together with board or a house to live in, garden, and a milk cow. A large percentage of the farm work is done by the owner and his family.

Land values vary according to the location with reference to towns, improved highways, and railroads, and according to improvements and the topography. The average value in 1920, as reported in the census, was $60.89 an acre, or an increase of $17.17 an acre over 1909. The lowest land values in the county occur on unimproved Gibson silt loam, the value of which ranges from $50 to

$60 an acre. On the Genesee, Eel, Holly, and Sharkey types (bottom lands), values range from $100 to $200 or more an acre.

Much credit is due the Clay County Farm Bureau for bringing about great improvements in agricultural practices, particularly as regards the raising of purebred livestock, the use of lime, and the growing of legumes.

SOILS

The first part of this chapter is a more or less technical discussion of the groups of soils of Clay County, and will be of interest mainly to students and workers in soil science. Under the subheadings the soil types are described and discussed in greater detail and more from a practical point of view.

The soils of Clay County lie both on uplands and alluvial plains. A classification into two groups on the basis of this general difference in distribution is really physiographic and geologic in that position and differences in the processes of accumulation of the soil-forming materials are taken into consideration in such a classification. But correlative with these physiographic and geologic differences are true soil differences which permit a grouping of the soils into those of the uplands and those of the alluvial plains.

On the basis of soil characteristics, these two groups may be defined as follows: (1) Soils which have developed characteristics entirely different from any that may be observed in the original or parent materials, and (2) soils which still retain the original characteristics due to the geologic processes which brought about the accumulation of the material. These two groups of soils may also be defined in these words: (1) Soils that are developed, and (2) soils that are young or as yet undeveloped.

The various members of the Gibson, Vigo, Cory, Parke, and Princeton series make up the first of these two groups, and those of the Genesee, Holly, Eel, Sharkey, and Waverly series make up the second. Of the first group, the Gibson, Princeton, and Parke soils have developed under normally good drainage, including both surface and internal, whereas the soils of the Vigo and Cory series have developed under imperfect surface and subsoil drainage.

Of the various well-drained soils, the several members of the Parke series are characterized by a profile that may be described as the most perfectly developed of any in the county. The profiles of the Gibson and Princeton soils are but slightly different in this respect from the Parke soils.

The features of these soils which mark their fullness of development are characterized by the following marks: A surface layer comparatively light in texture, with a thickness ranging from a few inches up to about 18 inches, depending, among other things, on the texture of the soil material. This comparatively light-textured surface layer is common to the normally developed soils of humid and subhumid regions, and for convenience has been designated by soil students as the A layer or the A horizon.

Beneath this comparatively light-textured layer lies a heavier-textured layer, usually browner or redder in color than the surface layer. This comparatively heavy-textured layer is called by soil students the B layer or the B horizon, and it has a range of dis-

tribution identical with that of the A horizon; that is to say, wherever a typical A horizon is found, underlying it is a heavier-textured layer, or a B horizon. For example, a sample of Parke silt loam, collected a little less than a mile west of Fairview Church, contains 20 per cent of clay in the surface soil, or A layer, and 44 per cent of clay in the lower stratum, or B layer. At a still greater depth lies material which again usually constitutes a comparatively light-textured layer, this being the glacial drift similar to the material from which the upper two horizons of this Parke silt loam have developed.

The partially weathered or unweathered material which lies below the true soil layers, horizons A and B[1], is called the C horizon, or the parent material. This parent material, underlying the Gibson, Vigo, Cory, Parke, and Princeton soils, has not been changed to any important extent from its original condition, except in the removal of lime carbonate which it originally contained. The leached portion of this material is usually only a few feet thick, and is underlain by the wholly unleached glacial drift.

The Princeton soils, like the Parke soils, are characterized by a profile consisting of a light-textured surface layer underlain by a heavier-textured layer, and that in turn by a lighter one. In the Princeton soils the material which forms the C horizon has been accumulated by wind action instead of by glacial deposition, as in the case of the Parke soils. This different source and process of accumulation of the parent material together with the resulting difference in textural composition constitute the main distinctions between the Parke and Princeton soils.

The difference between the quantities of clay in the surface or A layer and in the underlying heavy layer is a little greater in case of the Parke soils than in case of the Princeton soils. Furthermore, the latter soils have, on the whole, a somewhat browner surface soil than the Parke soils.

The Gibson profile differs in one important respect from that of the Princeton or Parke profile. In the lower half of its B horizon are to be found light-colored streaks, usually vertical in position, of gray to nearly white material. These streaks are very thin at first and they become wider with depth. At a depth of about 30 inches these streaks may or may not unite in a more or less well-defined gray or white layer of loose material usually without any definite structure. Where the gray material does not become abundant enough to constitute a distinct gray layer, it forms a horizon with many well-defined gray spots and streaks. Where the gray layer is well defined, it rarely attains a thickness of more than an inch, and probably in most places in Clay County a gray layer in Gibson silt loam is not developed as such.

Beneath the gray or grayish horizon is a layer that is usually heavier and tougher than the B horizon proper. It usually begins abruptly at the base of the gray layer, but its upper surface is uneven within the limits of a 2-inch range. It breaks into rather well-defined, vertical columns on exposure in a bank or on drying. Gray

[1] The A and B horizons together constitute the true soil, or that portion of the surface of the earth which has been changed to a marked degree by the processes of weathering. The A and B layers form what has been called the "solum" horizon by European scientists.

streaks from the overlying gray layer often extend down into the upper part of the cracks between the columns. This tough layer is toughest, hardest, and heaviest at the top, and gradually changes downward to the composition of the underlying parent material, which consists of glacial drift essentially like that beneath the Parke soils. The Gibson soils are like the Parke soils in all respects except for the gray streaks and spots, the layer which is locally continuous, and the lower, heavy, hard layer.

No samples of the Gibson soils, taken in such a way as to show the characteristics of these several layers, have yet been subjected to mechanical analyses. A series of samples, analyzed for the percentages of clay and the other classes of soil particles in the upper two horizons, shows 19 per cent of clay in the A layer and 25 per cent in the B layer. These samples were collected from a spot 2 miles southwest of Bowling Green.

The remaining upland soils, other than the Parke, Gibson, and Princeton soils, have been identified as belonging to the Vigo and Cory series. The last two groups of soils differ in general from the first three groups in having less well-developed profiles, having been developed under conditions of imperfect surface and internal drainage.

The Vigo soils, mainly silt loam, with small areas of fine sandy loam, are characterized by a light grayish-yellow surface soil, or A horizon, when examined in cultivated fields. In the virgin condition, as when the land is still covered with timber, the surface soil varies in color from very light grayish yellow to light gray, except in the upper 2 inches, where it is colored dark with organic matter. This virgin surface soil has a characteristic breakage, breaking into horizontal sheets or plates usually not more than a quarter of an inch in thickness. Beneath this surface layer, which is about 6 inches thick, lies a layer which has a ground color of gray but contains a considerable number of yellowish-brown spots, producing a mottled appearance.

The gray becomes gradually more bluish or drab with depth. This grayish layer is slightly heavier in texture than the surface layer, and, like the surface layer, it has a horizontal breakage, breaking into thin plates. This layer has a thickness ranging from about 20 to 30 inches, and beneath it is a layer of heavy, drab or bluish-gray material which breaks, when dry, into more or less well-defined vertical columns. On the outside of these columns there is, in many places, a coating of grayish, flourlike material. The interior of the columns is colored grayish or drab, with a great many yellow to rusty-brown spots. This layer extends to a depth of from 36 to 40 inches from the surface, giving it a thickness of about a foot. Beneath this horizon, or below a depth of 36 to 40 inches, lies a rather heavy clay, though it seems less heavy in texture than the layer above it and much softer. It is gray in color, but contains many rusty-brown and yellowish-brown spots. It is not known to what depth this layer extends. The material, at a depth of less than 10 feet from the surface, appears to be identical with that underlying the soils of the Gibson and Parke series.

It will be seen that the relationship of the Vigo soils to those of the Gibson and Parke series is suggested, at least, in their profiles.

It seems that the heavy layer with columnar structure and mottled, gray, and yellowish-brown colors lying beneath the gray layer in the Vigo soils is equivalent to the lower and comparatively heavy layer in the Gibson soils, which lies just below the imperfectly developed gray layer. In the Vigo soils the gray layer overlying this heavy layer is thick, extending up to the base of the cultivated portion of the soil and, in places, even up to the thin layer of the dark-colored surface soil, as on the timber-covered area of the Vigo soils. In the Gibson soils this corresponding layer is thin, and in places it is represented by detached segments instead of occurring as a continuous layer. Overlying the thin gray layer in the Gibson soils is a brown to yellowish-brown layer, heavier than the surface soil and heavier also than the gray layer, which constitutes a true B horizon. A corresponding soil horizon or layer is absent from the typically developed Vigo soils.

The Vigo soils have developed on areas so flat that the drainage has been poor. They have not developed normally, therefore. A B layer, or a heavy, well-oxidized layer lying immediately beneath the surface soil, has not developed. In its place is a layer which is no heavier in texture than the surface layer, as shown by the analysis of one sample only. This layer in the Vigo soils is gray in color, showing its subjection for the greater part of each year to excessive moisture. It has not been well aerated throughout its period of existence and the iron it contains has not been oxidized.

On the other hand, the underlying heavy and tough layer, the layer which has been described in the Gibson soils as being unusual, is well developed in the Vigo soils. The reasons for its development in the Vigo soils are not well understood, so that the problem need not be discussed here. Suffice it to say that it is a soil layer rather than a geologic layer. It seems certain that it has developed in the soil since the geologic material, of which the soil has been made, was laid down.

The Princeton and Parke soils are found on areas having a topography more strongly rolling than those areas on which the Gibson soils have developed. The Princeton and Parke soils are not characterized by either a gray layer or a lower heavy layer. On the other hand, they are characterized by an entirely normal profile—that is to say, a profile consisting of a comparatively light-textured surface layer, or A horizon, and a comparatively heavy-textured lower layer, or B horizon, which grades into the underlying parent material.

The alluvial soils of the county are all young, in that they have imperfect or wholly undeveloped soil profiles. They have been grouped into series largely on the basis of drainage and content of organic matter, as indicated by color. These groups are called the Genesee, Holly, Eel, Sharkey, and Waverly series.

The soils of the Genesee series are characterized by brown or grayish-brown surface soils and lighter-brown, unmottled subsoils. The surface is nearly level and the drainage is good, except during periods of overflow. The types have a moderate content of organic matter. Of this group the fine sandy loam, silt loam, and silty clay loam are mapped.

The Holly series includes soil types which have light-brown or grayish surface soils and mottled gray and yellow subsoils. The texture of the material is variable, particularly along the smaller streams. The types occur on flat or nearly flat areas, and the drainage is poor. One type of this series, the silt loam, was mapped in the survey of Clay County.

The Eel soils vary in color from brownish gray to grayish brown and have mottled subsoils. In Clay County these soils are found only on the Eel River bottoms.

In the Sharkey series are included the dark-colored soils of the Eel River bottoms. The parent material consists of sediments washed from the uplands, and these soils occur in situations where conditions have been most favorable for the accumulation of organic matter. The types of this series recognized in Clay County are the silt loam, silty clay loam, and silty clay.

The Waverly series includes types with very light-colored surface soils and gray subsoils which are mottled with yellow and brown. The drainage conditions are poor. The silt loam of this series is mapped in Clay County.

In all, 18 types, in addition to Mine dumps, are recognized in this survey. These soil types represent 10 series.

The following table gives the names and extent of the various soils mapped in Clay County:

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Vigo silt loam	79,296	34.3	Genesee silty clay loam	2,752	1.2
Gibson silt loam	69,056	33.1	Genesee fine sandy loam	2,624	1.1
Eroded phase	7,488		Vigo fine sandy loam	1,984	.9
Holly silt loam	20,288	8.8	Sharkey silt loam	1,408	.6
Eel silt loam	9,536	4.1	Sharkey silty clay	1,152	.5
Eel silty clay loam	8,384	3.6	Parke silt loam	1,088	.5
Genesee silt loam	6,976	3.0	Mine dumps	1,088	.5
Waverly silt loam	4,480	1.9	Princeton fine sand	960	.4
Princeton fine sandy loam	4,352	1.9	Cory fine sandy loam	576	.3
Sharkey silty clay loam	3,904	1.7			
Cory silt loam	3,648	1.6	Total	231,040	

GIBSON SILT LOAM

Under natural or virgin conditions Gibson silt loam has the following distinguishing characteristics, as they may be observed in a representative cross section: A thin layer of forest mold; a layer of brown, friable silt loam 3 or 4 inches thick, having distinct horizontal cleavage; a subsurface layer of light yellowish-brown friable silt loam in which the cleavage disappears, leaving no well-marked arrangement of the soil particles; and, beginning at a depth of about 10 inches, a subsoil (horizon B) which has a texture approaching that of a silty clay loam and which breaks into small angular fragments somewhat less than one-fourth of an inch in diameter.

Immediately below the B horizon, in a well-developed Gibson silt loam, is a rather thin, well-defined gray layer of silty material,

of loose consistency and irregular thickness. In most cases this gray layer is continuous. In cases where it is not continuous the layer consists of brown material having many gray silty spots. When well developed the layer rarely attains a thickness of 3 inches. Its lower boundary is usually more clearly defined than the upper one, the latter being made irregular by many tonguelike projections extending upward into the lower part of the subsoil, or B horizon.

Beneath the loose, gray silty layer lies a thin layer of heavier-textured material, heavier than the material constituting the subsoil, or B horizon. On drying, the material composing this layer breaks into rather well-defined, vertical columns, and into the cracks between the columns the gray material extends from the gray zone above, coating the columns with a gray powder. The top portion of this heavier layer is heavier in texture and, when dry, harder than its lower part, which grades into the substratum of parent material consisting of more or less oxidized glacial till.

This substratum of glacial till is called the C horizon, indicating the material from which this soil has developed. Lime carbonate has been leached from this partly weathered parent material, so that the soil is acid in reaction from the surface to the substratum of unmodified glacial till.

The main change from virgin conditions brought about by cultivation is a mixing of the forest litter with the top layer of the soil, forming a friable, brown to grayish-brown silt loam, to plow depth. In fields there is also the change due to loss of the surface soil by erosion and the subsequent plowing up of the upper portion of the subsoil. Such modifications are indicated by the "yellow clay" spots in plowed fields.

Areas of Gibson silt loam as mapped include patches of other types, particularly Parke and Vigo soils.

This type of soil is extensive, being mapped throughout the uplands. The largest areas lie in the eastern and northeastern parts of the county. The surface is undulating to gently rolling and hilly, and in some places the slopes are moderately steep.

This type is well drained, absorbs moisture readily, and conserves it in sufficient quantities to supply the needs of crops throughout ordinary periods of drought. On the steeper slopes where surface drainage is excessive, erosion may be checked by terracing, as is done in the South. Such terraces are made from 15 to 20 feet wide and they follow contours around the hill. They can not be used on grades exceeding a rise of 15 feet in a hundred, or on a 15 per cent slope.

Originally the Gibson silt loam was covered with a heavy growth of oak, beech, hickory, walnut, sugar maple, and elm.

The type has a slightly higher productive power than the Vigo silt loam, but it is not held in so high favor because it is more subject to erosion. It gives good yields of all grain and hay crops, and there is proportionately more fruit grown on it than on any other soil in the county. Corn yields average about 40 bushels when fertilized with 200 pounds of acid phosphate per acre. Wheat similarly treated yields from 12 to 20 bushels per acre, and oats without fertilizer yield from 15 to 20 bushels per acre.

Timothy and clover do well and are commonly cut for hay for a period of three years. The land is then pastured from three to five years, after which it is planted to corn, followed by wheat and oats.

Besides the area devoted to the general farm crops, a considerable acreage of the type is used for fruit production. Apples produced on this soil have superior flavor, color, and keeping quality. The varieties commonly grown are Gano, Stayman Winesap, Grimes Golden, Baldwin, and Rome Beauty. Peaches are uncertain on account of late spring frosts, but in favorable years good yields of high-quality fruit are obtained. Pears, plums, cherries, and grapes also are produced successfully. Small fruits thrive, and truck crops do particularly well.

Land of this type is valued at from $50 to $60 an acre for unimproved tracts, and from $100 to $140 an acre for well-improved farms.

Gibson silt loam, eroded phase.—The eroded phase of the Gibson silt loam is separated from the typical soil because of differences in topography and agricultural value. It differs from the typical soil only in that the surface material is in many places eroded away, exposing the subsoil or the deeper substratum.

Areas of this phase are developed chiefly along the upper reaches of intermittent streams and on the slopes bordering the larger stream bottoms.

In a few places, especially in the vicinity of Bowling Green, the drift material covering the underlying shales and sandstones is extremely thin and frequently is lacking. There are therefore inclusions of residual material which, if mapped separately, would be classed as Tilsit silt loam. Near Poland, as well as elsewhere in the county, varying quantities of small gravelstones are mixed through the subsoil.

The surface is so steep and hilly that cultivation over much of the phase is very difficult or impossible. Mapped areas of this phase include some small cultivated patches of the typical soil, located between the gullies. These patches produce fairly good crops. The eroded phase of the Gibson silt loam supports a fair growth of oak, beech, elm, and hickory.

PRINCETON FINE SAND

The Princeton fine sand, to depths of from 8 to 16 inches, consists of brown to chocolate-brown, loamy fine sand, underlain by yellowish-brown, loose fine sand. In many places the yellowish-brown subsurface sand becomes slightly sticky at lower depths, and extends to a depth of 36 inches or more. Below this is a slightly reddish-brown fine sandy loam, which grades into grayish, calcareous, fine sand, containing over 20 per cent of carbonates.

In extent the Princeton fine sand is small, and agriculturally it is of little importance. It occurs mainly in the southeastern part of the county, where it is found in the sandy belt of country bordering the eastern edge of the Eel River bottoms. These areas are closely associated with the Princeton fine sandy loam, and they occur in the form of narrow ridges and as hummocky areas.

Three small isolated knolls occur on the west side of Eel River outside the sandy country, two southwest of Booth School, and another 1¾ miles north of Bowling Green. The soil on these knolls is light brown to grayish brown in color and is less loamy than the typical Princeton fine sand.

The Princeton fine sand closely resembles Princeton fine sandy loam, the distinguishing feature of the former soil being the absence of a heavy subsoil within 3 feet of the surface. In origin of parent material they are practically the same, both having developed from sand which had been blown from the valley of the Eel River.

In texture this type is the lightest soil of the county. Drainage is thorough to excessive; consequently crops usually suffer for want of water, except when the rainfall is unusually well distributed.

Corn, oats, and clover are the chief crops. Of the small grains, rye may prove a very successful crop on this kind of soil. Clover is often winterkilled. The soil is better adapted to early truck crops than to general farming. Apples and small fruits are grown successfully. The application of barnyard manure and the plowing under of green-manure crops are particularly important in the successful management of this soil.

PRINCETON FINE SANDY LOAM

The Princeton fine sandy loam consists of light-brown to brown fine sandy loam, from 6 to 8 inches deep, underlain by lighter-brown or yellowish-brown fine sandy loam or loamy fine sand to depths of from 15 to 30 inches. Below this is a layer of light yellowish-brown or reddish material varying from heavy fine sandy loam to fine sandy clay loam. Beginning at depths ranging from 30 to 36 inches, the material is a yellowish or reddish-brown, heavy fine sandy loam, becoming lighter in texture with depth. The deep subsoil is grayish, calcareous fine sand. In places faint gray and yellowish-brown mottlings occur below 30 inches. In a few areas the surface soil is a fine sand or loamy fine sand to a depth of 16 or 20 inches, underlain by a reddish-yellow sandy clay. Mapped areas of this type include patches of other types of soil.

The parent material of this type consists, for the most part, of fine sand which had been blown from the valley of Eel River. In some localities the surface soil represents a veneer of wind-blown material deposited upon material similar to the subsoil and substratum of the Gibson silt loam. In other places the heavy subsoil, occurring at depths ranging from 12 to 30 inches, appears to be the result of a concentration of the finer particles. Below this heavy subsoil the material is more sandy.

The Princeton fine sandy loam is confined to the southeastern part of the county east of the Eel River. Areas varying in size are scattered throughout the sandy belt of country bordering the river bottoms. The largest areas lie west, northwest, and southwest of Clay City. The type occurs on isolated knolls, low narrow ridges, and hummocky and nearly level areas. On account of its position and favorable texture it is naturally well drained. It is much better drained than either the Vigo fine sandy loam or the Cory fine sandy loam.

The original forest growth consisted chiefly of beech, oak, hickory, elm, and sugar maple, with a few walnut and poplar.

Areas of Princeton fine sandy loam are devoted to general farming and trucking, and as a rule good crops are produced. Because of its loose, open nature the soil is easy to cultivate, and it can be worked under a wide range of moisture conditions. It does not wash badly, except on the steepest slopes.

Corn yields from 20 to 35 bushels; oats, from 20 to 30 bushels; wheat, from 10 to 15 bushels; and clover, from 1 to 1½ tons per acre. Wheat and clover are frequently winterkilled, owing to the fact that the soil "heaves" badly. Potatoes, melons, and small fruits are very satisfactorily grown on this type. Of the tree fruits, apples do best. Some peaches and pears are grown.

By proper management, including a liberal use of organic manures, the plowing under of green-manure crops, and the use of commercial fertilizers, very high yields may be obtained.

The value of this type of soil ranges from $75 to $150 an acre, depending on location and improvements.

PARKE SILT LOAM

The Parke silt loam is a brown or light-brown silt loam, from 10 to 15 inches deep, underlain by a yellowish-brown, compact, silty clay loam or clay. The subsoil is well oxidized and has no hardpan layer. The area at Poland has a nearly level surface, and the soil is thoroughly drained because of its substratum of reddish, sandy and gravelly material. This reddish substratum outcrops on slopes northwest of Brazil, and apparently underlies most of the type. This type is derived largely from sandy glacial material. The soil is deepest where it adjoins areas of Princeton fine sandy loam, as it may be observed northwest of Poland.

With the exception of two small areas south of Vinegar Hill School and those mentioned above, the type is confined to the northwest corner of the county. It is not an extensive soil. Excepting the Poland area, the type occurs on knolls, ridges, and slopes and is well drained.

Practically all of the Parke silt loam is in cultivation. Corn, wheat, oats, and clover are the principal crops grown. Corn yields 45 bushels and wheat yields 16 to 20 bushels per acre. Rye is grown for pasturage. The selling value of this land ranges from $60 to $75 an acre.

VIGO FINE SANDY LOAM

The surface soil of the Vigo fine sandy loam is a brownish-gray, fine sandy loam or loamy fine sand, 6 to 8 inches deep. The subsoil consists of a light-gray fine sandy loam mottled with rusty brown and yellowish brown, and at a depth of 12 or 14 inches it grades into a heavy, light-gray fine sandy loam. At depths ranging from 16 to 20 inches the material is light-gray, heavy fine sandy loam to fine sandy clay, usually containing a moderate quantity of rusty-brown concretions. Below 30 inches rusty-brown and yellowish-brown mottlings are common.

The soil, though moderately compact in its virgin state, becomes loose under cultivation. In occurrence this type is closely associated with the Princeton fine sandy loam and Cory fine sandy loam. It occupies positions between these two types, and frequently mapped areas include small patches of each of these. In places this type of soil represents a thin covering of sand which had drifted over Vigo silt loam.

The Vigo fine sandy loam occurs as nearly level areas in the sandy belt, the largest areas being found near Clay City. The individual bodies are not large, but the total area gives this soil considerable importance agriculturally. The surface drainage is fairly good, but the underdrainage is poor.

Areas of the Vigo fine sandy loam are devoted to general farming, and as a rule fair crops are produced. Corn yields from 15 to 35 bushels per acre. The oat crop is not very satisfactory. From 20 to 25 bushels per acre is the usual yield. Rye produces well, but is not extensively grown. The average yield is about 20 bushels per acre. Clover and timothy do fairly well, averaging from 1½ to 2 tons of hay per acre. Some difficulty is experienced in getting a good stand of clover. Potatoes, melons, and tomatoes are successfully grown.

A rotation commonly followed is corn, wheat, clover, and pasture, though no definite system is practiced by the majority of farmers. Green manuring should be practiced to a greater extent, especially on farms where not much stable manure is used. Farms on this soil range in value from $75 to $125 an acre.

VIGO SILT LOAM

Under a thin covering of forest litter, from one-half to 1 inch thick, virgin Vigo silt loam consists of a 2-inch or 3-inch layer of gray or light-gray, floury silt, underlain by a layer of very light gray, floury silt loam with rusty concretions and stains. The upper silt layer shows distinct horizontal laminations and often contains black iron concretions, and, being overlain by the layer of forest litter, it is somewhat colored by organic matter. Beneath the third layer of floury silt loam, which contains the rusty concretions and stains, the material is slightly heavier in texture and is more marked with yellowish brown and brown. Lower down, and just above a 20-inch depth, is a gray layer. Below this gray layer is a stratum of compact silty clay having a columnar structure. The upper part of this layer is streaked with whitish silt along the prominent cleavage planes. The color of the outside of the "columns" and of the inner surfaces of the small root channels is yellowish brown, whereas the interior of the fragments is colored drab or grayish. The fragments contain black iron concretions. Deeper down the material is a gritty clay loam, less compact and colored more yellow and brown than the columnar stratum above it. In places at a depth of about 5 feet a concentration of black iron and manganese is found. At a depth of about 10 feet the material consists of light-grayish, gritty, calcareous, cemented Illinoian till.

In cultivated fields this soil, when wet or moist, appears rather dark or grayish brown in color In dry fields the soil appears nearly white.

Mapped areas of Vigo silt loam include much soil that may be regarded as transitional, or which occurs between the lightest-colored soils on the flattest areas and typical Gibson silt loam.

All layers of this soil, above the Illinoian till, are acid in reaction, the top layer being the least acid and the heavier subsoil the most acid.

The texture and color of the surface soil and subsoil are fairly constant throughout the entire area. A marked variation from type was noted southeast of Clay City, where the soil on small included areas is a brownish loam containing some fine gravel and iron concretions. Another marked variation from type may be found east of Bowling Green, in the higher-lying country, where the soil on small areas approaches Gibson silt loam in color.

The Vigo silt loam covers approximately one-third of the county, or constitutes about one-half of the uplands. It is widely distributed, the largest bodies occurring east of Saline City and in the north-central part of the county. The soil is derived from Illinoian drift, or possibly in part from the so-called loess.

The surface of most of this soil is mainly flat, and the natural drainage is poor. Both the surface soil and subsoil remain in a saturated condition for several days after heavy rains. Along gentle slopes and where the type adjoins the Gibson silt loam the relief is usually sufficient to insure moderately good surface drainage. The mottling in the subsoil indicates that aeration and internal drainage are poor.

This soil was originally forested with beech, oak, hickory, elm, walnut, and sugar maple.

The Vigo silt loam is widely distributed, and is one of the most important soils of the county. Its level topography makes possible the use of tractors and practically all kinds of improved machinery. Probably 90 per cent of the type is used in the production of general farm crops. Special crops, like tomatoes, pimentos, and fruits, are grown. Corn yields from 25 to 50 bushels per acre; oats, from 15 to 35 bushels; wheat, from 10 to 20 bushels; timothy, from 1 to 2 tons; and clover, from 1½ to 2 tons per acre. A large acreage is devoted to timothy alone. The acreage in clover is increasing. Clover and timothy mixed, are not so commonly grown as on some of the other soil types, for the reason that the timothy tends to crowd out the clover.

A cropping practiced on this soil by progressive farmers may be described as follows: Sod land is plowed and planted to corn. The following spring a coating of barnyard manure is applied, and the land is sown to oats. After the removal of the oat crop the ground is sown to winter wheat, the latter serving as a nurse crop for the clover, which is sown the following spring. Land is kept in grass from one to three years. Rye is grown to a limited extent for pasturage.

The livestock industries consist of hog and sheep raising, dairying, and the raising of some beef cattle. The average farmer keeps from 7 to 10 milk cows. There are a number of silos located on this soil, and considerable corn is grown for silage. The yields of silage corn range from 5 to 10 tons per acre. Soy beans and cow-

peas are grown, but not extensively. They are usually planted with the corn.

Although it has a low content of organic matter, the Vigo silt loam is mellow and easily cultivated. It does not bake badly on drying, and a good seed bed is easily developed.

Although the greater part of this type has probably been in cultivation for 40 or 50 years, it is only recently that any marked attention has been given to its permanent improvement. There are a few efficiently managed farms. Farming methods are poor on the majority of farms. A large percentage of the farms on this type are operated by the owners.

The selling value of the Vigo silt loam ranges from $60 to $150 an acre, depending on the drainage, location, and improvements.

CORY FINE SANDY LOAM

The surface soil of the Cory fine sandy loam consists of a dark grayish-brown, heavy, fine sandy loam or loam, underlain at a depth of about 8 inches by dark grayish-brown to dark-drab, fine sandy clay loam or clay, slightly specked with rusty brown. At a depth of about 20 inches this subsurface layer, in turn, grades into a clay or sandy clay mottled with light gray, yellowish brown, and drab.

The Cory fine sandy loam contains a high percentage of organic matter which gives it a characteristically dark color. It has been modified by sand, blown and washed in from the adjacent higher ground. Its sand content is therefore variable.

The type is not extensive. The largest areas are situated 2 miles southwest of Blair School and near the southern extremity of the sandy belt. This type is associated with the Princeton soils and at lower levels, with Vigo fine sandy loam.

The Cory fine sandy loam is well adapted to corn, and most of the land is devoted to this crop, producing an average yield of 40 bushels per acre, with a maximum yield of 75 bushels. Clover does exceptionally well. During dry seasons crops do well on tiled land. In wet seasons, however, conditions are not favorable for the growth of crops, except where the land is artificially drained. The original forest growth consisted of elm, cottonwood, and soft maple.

CORY SILT LOAM

The Cory silt loam is a gray to dark-gray, friable silt loam, underlain at a depth of about 8 or 10 inches by a mottled gray and yellowish-brown silty clay loam. At a depth of approximately 20 inches this subsurface layer grades into a mottled light-gray and yellow material varying from silty clay loam to silty clay. Except for the color of the surface soil, the detailed description of Vigo silt loam applies equally to Cory silt loam. The comparatively high content of organic matter gives this soil its distinguishing dark color. When wet, it appears very dark. This explains why it is locally referred to as "black land."

The Cory silt loam is the only prairie soil in Clay County. It occurs on divides of level topography. Mapped areas include some small depressed patches. Originally this kind of land was poorly drained and supported a growth of prairie grass, with some willow

in places. The soil is typically developed north of Cory, on what is known as "Christies Prairie." Other fair-sized areas occur at and near Clay Prairie School. Smaller areas are scattered throughout the western part of the county, and it is known to be extensive in Vigo County. It is not found east of the Eel River.

Christies Prairie, the largest area of Cory silt loam in Clay County, was first drained by means of open ditches, and was brought under cultivation about 60 years ago. Many farms located on this type are now tile drained. Corn was the first crop produced and it is to-day the principal crop grown. Yields range from 20 to 50 bushels, the average being about 30 bushels per acre. Wheat yields from 10 to 20 bushels, and oats about 30 bushels per acre.

Clover does well, although good stands are not always easily obtained. Good yields have resulted from a mixed seeding of clover and timothy in February, March, or April. Timothy, when grown alone does best when sown in the fall with winter wheat. In the spring clover is added, being either drilled or sown broadcast. Alsike clover thrives on this soil, especially on the more poorly drained areas. Clover and timothy, mixed, yield from 1½ to 2 tons of hay per acre. Alfalfa, soy beans, and cowpeas do well. The rotation most commonly practiced on this soil consists of corn, wheat, and clover, grown in the order named.

The Cory silt loam is recognized as the most productive soil of the uplands. It is a stronger soil than the Vigo silt loam, with which it is closely associated.

Drainage is the chief limiting factor in crop production on this type. Lines of tile placed at intervals of 50 feet and at depths of from 30 to 36 inches prove highly satisfactory. Fields are plowed to depths ranging from 8 to 10 inches in narrow lands in order to effect better surface drainage.

GENESEE FINE SANDY LOAM

The surface soil of Genesee fine sandy loam consists of from 10 to 20 inches of brown to light-brown fine sandy loam or loamy fine sand. The subsoil has about the same texture as the surface soil, but usually it becomes lighter in color with depth. In some cases it is composed of alternate sandy and silty layers.

This type occurs on the Eel River flood plain, and represents recently deposited alluvial material. In reaction the sediment may be neutral or calcareous. This soil occupies strips of overflow land, which border the stream channel and which occur as low ridges or as low natural levees. Away from the stream channel the proportion of sand in the soil gradually decreases, and the type merges into Genesee silt loam. A few small isolated areas occur along parts of the abandoned river channels in the vicinity of Howesville. These areas, which are located at a considerable distance from the present channels, have a hummocky or uneven topography, and are less subject to overflow. Here the soil closely resembles the sandy members of the Elk series, mapped in Gibson County. On the whole, this is the best-drained alluvial soil in Clay County, and it dries out quickly after the overflow water subsides.

This type of soil is easily cultivated, and though it is deficient in humus, it is naturally productive. Corn is the chief crop, yielding

on an average about 40 bushels per acre. Wheat yields from 10 to 12 bushels, and clover about 2 tons per acre. Melons and early garden crops do exceptionally well, but very little attention is given to them, owing to the distance of this type of soil from ready markets. Only small areas of this soil are found on individual farms.

GENESEE SILT LOAM

The surface soil of Genesee silt loam is a brown silt loam, 8 to 10 inches deep. In places the soil approaches the texture of a loam. The subsoil is a brown, heavy silt loam to silty clay loam. This is a loose, friable soil and easy to cultivate. It contains only a fair supply of organic matter. The materials below the subsoil, or below depths varying from 2 to 3 feet, consist of river sands and gravels. At the margins of some areas, next to the streams, this soil merges into Genesee fine sandy loam. Some mapped areas of this type include strips or patches of sandy soil.

Areas of Genesee silt loam are confined to the Eel River bottoms, where they border the stream channel or are separated from it by narrow strips of Genesee fine sandy loam. These sedimentary materials are more or less calcareous.

The surface of these areas is level or is marked by long, shallow depressions which are either abandoned stream channels or depressions caused by more recent erosion by flood waters.

This type of soil is subject to overflow. It has good underdrainage and conserves sufficient moisture to meet the needs of ordinary crops.

The Genesee silt loam is considered a good soil for general farming, and nearly all of it is under cultivation. Corn yields from 30 to 70 bushels per acre, and wheat from 10 to 15, with an average of 12 bushels per acre. Oats make a rank growth at the expense of grain development; and because the yields are low the acreage planted each year is small, the yields varying from 15 to 20 bushels per acre. Clover yields from 1½ to 3 tons per acre, and clover and timothy, mixed, from 1½ to 2½ tons per acre. When clover is threshed for seed, the average yield is 1 peck per acre. The best alfalfa fields produce yields varying from 1½ to 2 tons per acre.

A common rotation consists of corn (two years), wheat (two years), followed by clover. A considerable area of the type is devoted to corn year after year.

The value of farm lands on this type of soil, locally known as "black-walnut land," ranges from $100 to $150 an acre, depending on location and improvements.

GENESEE SILTY CLAY LOAM

The Genesee silty clay loam is a brown silty clay loam, about 10 inches deep, grading into a subsoil of the same color and of the same or slightly heavier texture. The soil is rather compact. If plowed when wet it clods badly and its cultivation is difficult. The surface soil and the subsoil are neutral in reaction.

This type of soil occurs on the Eel River flood plains at no great distance from the present channel. It is usually found adjoining areas of Genesee silt loam and represents the heaviest member of the Genesee series. The largest and most typically developed areas are

in the vicinity of Bowling Green. The type is subject to floods, which usually occur during the winter and spring months, though sometimes heavy rain during the growing season results in overflows that damage crops.

The surface of the type is nearly level to gently undulating, and the natural drainage is good.

Practically all of the Genesee silty clay loam has been cleared and farmed. Corn, wheat, clover, and alfalfa are the main crops. Corn yields between 50 and 80 bushels per acre. Wheat yields from 12 to 25 bushels, and alfalfa from 2 to 3 tons per acre. Three cuttings of alfalfa are made each year, and the stand usually lasts from six to eight years.

The rotation generally practiced on this soil may be described as follows: Wheat (fall sown), followed by clover (spring sown), followed by corn. The clover is harvested either for seed or hay. Sod land for corn is usually plowed in the spring. On some fields corn has been grown consecutively for over 40 years without any appreciable diminution in crop yields. No commercial fertilizers are used. In general, Genesee silty clay loam is farmed and sold in conjunction with other bottom-land soils.

HOLLY SILT LOAM

The surface soil of the Holly silt loam is a light-brown or brownish-gray, mellow silt loam, 8 to 12 inches deep. The subsoil to a depth of 36 inches or more is a mottled gray, yellow, and brown silty clay loam. The soil is acid in reaction, the degree of acidity increasing with depth. On drying out, both the soil and subsoil in places have a gray to drab color, resembling somewhat the Waverly silt loam.

As mapped the type is subject to considerable textural variation. On the narrow bottoms along small streams the soil is lighter in texture, the material ranging from fine sandy loam to loam. The sand content is highest along the stream courses.

The type is one of the most extensive of the lowland soils. It occurs along practically all of the smaller streams in the county, some areas extending some distance into the Eel River bottom lands.

All of this land is subject to overflow, though some of it is flooded only occasionally. Since the straightening and deepening of the lower courses of Birch Creek and Eel River extensive areas of this soil are less frequently overflowed now than formerly.

Areas of this soil have an almost level topography. Nevertheless, the surface drainage is moderately good, except over parts of the broader bottoms. The internal drainage is poor, as indicated by the prevailing gray and mottled appearance of the subsoil.

All the type was originally forested with oak, hickory, ash, beech, red birch, sycamore, gum, and elm. Uncleared areas remain principally along the smaller streams. They are used for pasture.

Grain and hay are the principal crops grown on this soil. With proper management and during favorable seasons, corn yields as much as 80 bushels per acre, and alfalfa (three cuttings per year) from 3 to 5 tons per acre. Wheat yields from 10 to 15 bushels, and clover and timothy, mixed, from 2 to 2½ tons per acre. Clover

alone yields from 2 to 3 tons of hay and from 1 to 2 pecks of seed per acre.

The usual rotation is pasturage (land fall plowed when practicable), corn, wheat, and clover. Leading farmers plow this land 8 or 10 inches deep.

The value of Holly silt loam ranges from $75 to $150 or more an acre, depending on the state of cultivation, location, and character of overflow.

EEL SILT LOAM

The surface soil of Eel silt loam is a mellow, brown, or slightly grayish-brown silt loam, and the subsoil below 10 or 15 inches is distinctly mottled brown, gray, and yellow. The surface soil and subsoil are neutral in reaction, like the Genesee soils.

In some places the surface soil is rather sandy, as on narrow strips which were formerly beds of old streams. Where these occur, mapped areas of Eel silt loam include patches of Eel silty clay loam or Sharkey silty clay loam.

This type is found only on the Eel River bottoms, where it is very extensive, especially west of Clay City. It is closely associated with the Genesee and Sharkey soils.

Much of this land is tile drained. The outlets are open ditches. Land of this type dries out slowly in the spring, and is usually plowed in the fall.

The greater part of this type is in cultivation, the remainder being in forest of oak, hickory, elm, and ash.

This soil is well adapted to corn, wheat, and hay, and is also adapted to alfalfa where sufficiently well drained. From clover seeded in the spring, an excellent crop of hay may be harvested the following October. Many farmers do not cut spring-seeded clover for hay, but turn it under in the fall to enrich the soil. Potatoes do well on this type, but are at present grown only for home use.

The value of Eel silt loam varies from $100 to $150 or more an acre.

EEL SILTY CLAY LOAM

The surface soil of the Eel silty clay loam is a brownish-gray silty clay loam from 6 to 10 inches deep. The subsoil consists of a lighter brownish-gray, compact silty clay loam mottled with light gray, yellow, and drab. With increase in depth the subsoil generally becomes heavier, more plastic, and shows more drab mottling.

This type occurs on the flat, poorly drained areas of the Eel River bottoms, being subject to overflow. In places some of this land lies at the foot of the upland slopes, and much of it lies at a lower level than the associated Eel silt loam and Genesee silty clay loam. Thus crops on this kind of soil are sometimes injured after rains by standing water. The areas are situated back from the stream channel, from which they are separated by areas of Genesee fine sandy loam or Genesee silt loam.

The Eel silty clay loam is distinguished from the Genesee silty clay loam chiefly by its mottled subsoil, and it differs from the Sharkey silty clay loam by the color of its surface soil. In some places the Eel silty clay loam merges imperceptibly into the Genesee and Sharkey soils.

The largest areas of Eel silty clay loam are found southeast of Old Hill and in the southeastern part of the county.

The greater part of the type is under cultivation, the rest being forested, principally with oak, hickory, elm, and ash. This is a very productive soil. Under favorable conditions yields of 75 bushels of corn and 20 bushels of wheat per acre are obtained. Corn is the main crop. Clover and alfalfa are grown profitably. Alsike clover grows successfully on the rather poorly drained areas.

Here, as on other bottom lands of the county, artificial drainage is resorted to, the fields having lines of tile which empty into open ditches. Land of this type dries out slowly in the spring; hence it is usually plowed in the fall.

The value of Eel silty clay loam varies from $100 to $150 per acre.

SHARKEY SILT LOAM

The Sharkey silt loam is a dark-gray silt loam, from 8 to 12 inches thick, underlain to a depth of about 36 inches by a somewhat lighter gray silty clay loam, moderately compact, and faintly mottled with yellow and rusty-brown stains. When dry the soil has a gray appearance, although it is not nearly so light in color as the Waverly silt loam or the Holly silt loam.

There are two areas of this type of soil in the county. They occur in the western part along Big Slough and another smaller stream. Ordinarily, Holly soils would occur on these areas; but because the soil here is darker in color it is given a different name. The darker color of the soil on these two areas may have developed because of backwater which was formed by the Splunge Creek reservoir when the Wabash & Erie Canal was in use, or because of a prairie cover. With the exception of that area of the type lying within the present Splunge Creek reservoir levee, this land is subject to overflow.

The surface generally is level or slopes gently toward the streams. The surface drainage is moderately good, except in a few flat areas where the soil and subsoil remain water-logged for some time after overflows.

The Sharkey silt loam is a productive soil. It is easily cultivated and retentive of moisture. Practically all of it is under cultivation. Corn, wheat, and clover are the main crops. Alfalfa does well on the better-drained areas. Alsike clover is successfully grown. The yields on this type and the price per acre are about the same as for the Holly silt loam.

SHARKEY SILTY CLAY LOAM

The surface soil of Sharkey silty clay loam is a dark-gray to drab silty clay loam, 8 to 10 inches deep, underlain to a depth of 20 inches by a silty clay loam or silty clay, marked with light-gray mottlings and tinges of brown. Below this is a silty clay loam or silty clay, mottled with drab, gray, and yellow. When dry the soil is steel gray in color.

This soil is developed only on the flood plain of the Eel River, where it is associated with the Sharkey silty clay and soils of the Eel series. It contains a relatively high percentage of organic matter

and is locally known as "black land" or "blue muck." This kind of soil is not nearly so dark colored as the Clyde or Maumee soils of northern Indiana.

The principal areas of Sharkey silty clay loam lie in Splunge Creek reservoir and in the southern part of the county. There are a number of small scattered areas. The area east of Egypt School has a brownish-gray surface soil representing a gradation toward the Eel silty clay loam.

There are also a few smaller areas varying from the typical soil. Included with the type areas as mapped are some patches of Sharkey clay, a very poorly drained soil. About 2½ miles east of Feederdam Bridge is a 100-acre area of muck included in a larger area mapped as Sharkey silty clay loam. Here the soil is black and mellow, being derived almost wholly from marsh vegetation.

The surface of the areas mapped as Sharkey silty clay loam is level or slightly depressed, and the natural drainage for the most part is poor. A considerable area of this soil has been drained by means of tile and open ditches. The greater proportion of this land is subject to overflow; some of it is seldom flooded, and some parts are protected from overflow by dikes or levees.

The Sharkey silty clay loam is considered one of the most productive bottom soils in the county. Probably 80 per cent of the type is under cultivation. The unfarmed areas support a growth of cottonwood, willow, elm, and some ash.

Corn is the main crop grown, the average yield being about 50 bushels per acre. Wheat yields from 20 to 30 bushels per acre. Oats are not grown successfully. Alfalfa does exceptionally well on the better-drained areas and alsike clover succeeds on areas only moderately well drained.

The selling value of this land ranges from $100 to $150 an acre, depending on drainage and location.

SHARKEY SILTY CLAY

The surface soil of the Sharkey silty clay consists of a heavy, dark-gray to drab, silty clay to clay, about 6 or 8 inches deep. This grades downward into a bluish-gray, heavy, plastic clay. The lower subsoil, at a depth of about 20 inches, consists of bluish-gray or drab plastic clay, which becomes mottled with light-gray and yellowish-brown colors at a depth between 32 and 36 inches. The soil is neutral in reaction.

The type is not extensive, being found only in the Eel River basin. The largest areas occur in the southern part of the county, south of the river. This kind of land is locally known as "blue muck," and it is very much like Sharkey clay, as found in Gibson County.

The Sharkey silty clay occupies flat and depressed areas which were formerly ponds or old stream channels. It is closely associated with Sharkey silty clay loam, and the boundary separating these two types is not always sharply defined. Drainage is very poor and much of the land is in a swampy or semiswampy condition.

The areas lying within Splunge Creek reservoir have been tiled and brought under cultivation. The soil seems well suited to corn, the yields ranging from 40 to 60 bushels per acre. Wheat yields

from 20 to 30 bushels per acre. Oats make a rank growth. The greater part of the type is forested with cottonwood, willow, and elm. Water-loving grasses grow luxuriantly.

Owing to the heavy character of the Sharkey silty clay, it is difficult to handle. When plowed too wet it clods badly. It is best to plow this soil in the fall to a depth of 8 inches, so that the freezing and thawing of the winter months may help to pulverize it. In this way a moderately friable and pulverulent seed bed may be readily obtained the following spring.

WAVERLY SILT LOAM

The Waverly silt loam is a mellow, light-gray or light grayish-brown to almost white silt loam, 8 or 10 inches deep, overlying a mottled, light-gray or yellowish-brown silty clay loam. Where the lower subsoil is light-gray material, dark-brown iron stains are common at a depth of about 24 inches from the surface.

In places where the surface layer is brownish gray, this soil closely resembles Holly silt loam with which it is closely associated. Thus the boundary between these two types is difficult to determine. There are included in mapped areas of this type patches of Waverly silty clay loam which, on account of their small size are not considered of sufficient importance to justify separation. Such included patches are most conspicuous along Birch Creek south of Jeffers School.

The Waverly silt loam occurs on the bottom lands of Eel River and its tributaries. The material consists of sediments washed from the adjoining uplands. It occurs on level tracts and in depressed, poorly drained areas which are subject to overflow. The largest areas are west of Cherokee School, northeast of Coalmont, and near the southeastern corner of the county. The first-named area lies higher than other areas of the type, is better drained, and is not unlike the Vigo silt loam of the uplands.

The Waverly silt loam is deficient in organic matter, and the soil, when wet, becomes rather sticky. It is not valued so highly as the other bottom-land soils; but when well drained and properly managed it produces fair yields of corn, oats, wheat, and hay. It is well adapted to grass, and a considerable acreage is devoted to pasture. Well-drained areas yield an average of 30 bushels of corn per acre.

This type responds readily to applications of barnyard manure, which not only increases crop yields but renders the soil more easy to cultivate.

The Waverly silt loam is usually sold in connection with associated types. Its value varies from $50 to $75 an acre.

MINE DUMPS

Mine dumps include waste material or refuse from coal mines. In the case of shaft and slope mines the dumps represent impure coal, slaty material, shale, clay, and rock piled in a heap upon the surface, the size of the dumps depending on the extensiveness of underground operations. These dumps occur either as conical knolls or as narrow ridges.

Where strip or surface mining has been carried on, the dumps occupy more extensive areas. Excavations made by powerful steam shovels are frequently from 30 to 50 feet deep. The material overlying the vein of coal is removed and piled in parallel ridges, making a very uneven surface. The largest of these excavations or disturbed areas represent from 200 to 400 acres or more of nonagricultural land.

A part of the large mine-dump area northeast of Clay City has been planted to peach trees, which appear to be in a thriving condition. In one or two instances sweet clover, which grows luxuriantly, is sown for bee pasture.

Mine dumps are most common in the northern and northwestern parts of the county.

SUMMARY

Clay County is situated in the southwestern part of Indiana, one tier of counties separating it from Illinois on the west. It comprises 11 townships, and has a total area of 361 square miles, or 231,040 acres.

The topography varies from level and undulating to rolling, being broken even along the small drainage ways. Conspicuous, broad, practically level bottoms are developed along the main streams. The elevation ranges from somewhat more than 500 feet above sea level in the southern part to 700 feet or more in the northeastern part.

Clay County forms a part of the Wabash "Lowland" of western Indiana. The greater part of the county is drained by Eel River and its tributaries. The northwestern part drains westward through Otter Creek.

Clay County was formed in 1825. The population in 1920 was 29,447, of which 68.4 per cent was classed as rural. Brazil, the county seat and largest town, has a population of 9,293. Clay City, Staunton, Centerpoint, Knightsville, Carbon, Coalmont, Bowling Green, Poland, and Harmony are other important towns.

The mining of coal and the manufacture of clay products are important industries in certain sections of the county.

Eight railroad lines and an electric interurban line, crossing or entering the county, provide adequate transportation facilities. The wagon roads are being improved.

General farming is the type of agriculture practiced in Clay County. Corn, wheat, oats, timothy, and clover are the chief crops. The raising of hogs is the principal livestock industry. Most of the hogs raised are big-type Poland-China. Shorthorn, Jersey, and Holstein are the leading breeds of cattle. Poultry, dairy products, and beef cattle are the main sources of income.

The average size of farms is reported in the 1920 census as 84.7 acres. There are several farms of over 500 acres each.

About 88 per cent of the area of the county is in farms; and of the farm land, about 79 per cent is reported improved. About 74 per cent of the farms are operated by the owners. The average value of land, as reported in the 1920 census, is $60.89 an acre. The prices of farm lands ordinarily range from $50 to $150 an acre.

The soils of Clay County are derived largely from the deposits of the Illinoian glaciation. The drift or till has weathered to a material of smooth silty texture, giving rise to soils of a silty character.

Eighteen soil types, including one phase, are recognized and mapped in Clay County. These represent 10 soil series.

The Gibson, Vigo, Parke, Princeton, and Cory soils occur on the uplands, and the Genesee, Eel, Holly, Waverly, and Sharkey soils are found on the first bottoms or flood plains.

Areas of Gibson silt loam are somewhat rolling and well drained. Except for the eroded phase, this soil is adapted to the same crops which are grown on the Vigo soils.

The Princeton series includes the lighter-colored, well-drained, sandy upland soils. Two types are mapped, Princeton fine sand and Princeton fine sandy loam. The former is a droughty soil, and the latter produces fair yields of the general farm crops.

The Parke silt loam is not an extensive type. The natural drainage is generally good. The soil is used for growing the general farm crops, although it does not have a high degree of productiveness.

The Vigo soils are gray to brownish-gray upland soils occurring on flat and poorly drained areas. Because of the poor drainage conditions under which these soils have developed they differ from the Gibson, Parke, and Princeton soils in not having well-oxidized subsoils.

The Cory series includes the dark-colored upland soils. Two types of this series are mapped in the county, namely, Cory silt loam and Cory fine sandy loam. The silt loam is largely a prairie soil. The Cory soils are considered the most productive of the upland soils, a distinction due chiefly, it is believed, to the higher percentage of organic matter they contain. Practically all these types are under cultivation and produce good yields of corn, wheat, clover, and grass.

Of the Genesee series three types are mapped, the fine sandy loam, silt loam, and silty clay loam. These are all good soils for general crops, and are especially adapted to alfalfa. They are subject to overflow but are naturally well drained.

The Holly series includes the acid, brownish-gray or light-brown soils of the first bottoms, and is represented by the silt loam. This type of soil has a mottled subsoil, and the land is subject to overflow.

The Eel series includes the grayish-brown soils having mottled subsoils. Two types of this series are mapped in Clay County, namely, Eel silt loam and Eel silty clay loam, which are confined to the Eel River bottoms. These soils are well suited to the production of corn, wheat, clover, and alfalfa. They are subject to overflow.

The Sharkey series includes the dark-gray soils of the first bottoms. In the county this group of soils is represented by Sharkey silt loam, Sharkey silty clay loam, and Sharkey silty clay. The silty clay loam is a good soil for general farming. The silty clay is difficult to handle. These soils need drainage, but when reclaimed they are very productive.

The Waverly series includes light-gray alluvial soils, and is represented in the county by Waverly silt loam. The type is deficient in organic matter and is naturally poorly drained. When drained, fair crops of corn, wheat, and hay are obtained.

PART II. THE MANAGEMENT OF CLAY COUNTY SOILS

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INTRODUCTION

The farmer must know his soil and have a sound basis for every step in its treatment. Building up the productivity of a soil to a high level in a profitable way and then maintaining it is an achievement for which every farmer should strive. The business of farming should be conducted as intelligently and as carefully as any manufacturing business. Every process must be understood and regulated, from the raw material to the finished product, in order that all processes may be successful. The farmer's factory is his farm. Each kind of soil presents different problems that must be studied and understood in order that crops may be produced in the most satisfactory and profitable way.

It is the purpose of the following discussion to call attention to the deficiencies of the several soil types of Clay County, and to outline in a general way the treatments most needed and most likely to yield satisfactory results. No system of soil management can be satisfactory that does not in the long run produce profitable returns. Some soil treatments and methods of management may be profitable for a time but ruinous in the end. One-sided or unbalanced soil treatments have been altogether too common in the history of farming in this country. A properly balanced system of treatment will make almost any soil profitably productive.

CHEMICAL COMPOSITION OF CLAY COUNTY SOILS

The following table gives the results of chemical analyses of the different types of soils in Clay County, in pounds of elements per acre, in 2,000,000 pounds of the surface of an acre, representing the plowed surface of the mineral soils, and a foot or more in the case of muck.

Chemical composition of Clay County soils

[Elements in pounds per acre, 2,000,000 pounds]

Element	No. 15.1, Vigo silt loam	No. 7, Vigo fine sandy loam	No. 14.1, Gibson silt loam	No. 20, Parke silt loam	No. 4, Princeton fine sandy loam	No. 5, Princeton fine sand	No. 11, Cory silt loam	No. 6, Cory fine sandy loam
Phosphorus [1]	874	874	699	1,312	699	874	1,398	699
Potassium [1]	2,294	673	1,850	1,850	841	673	1,850	1,177
Calcium [1]	3,572	3,286	2,286	4,714	6,429	7,000	7,286	7,572
Magnesium [1]	2,774	1,930	2,171	4,101	3,619	3,136	4,222	2,895
Manganese [1]	430	140	140	3,310	140	140	140	140
Iron [1]	42,465	14,250	28,927	25,792	16,102	18,240	25,792	9,120
Aluminum [1]	36,591	16,439	34,045	30,863	18,242	16,545	41,363	17,924
Sulphur [1]	962	1,122	721	561	721	721	721	721
Phosphorus [2]	68	52	61	52	68	68	68	68
Potassium [2]	101	50	84	84	67	50	118	34
Nitrogen [3]	2,400	1,200	2,000	2,400	1,800	1,600	3,400	2,000
Potassium [3]	31,276	10,257	28,922	27,913	15,974	12,611	27,408	8,744

Element	No. 1, Waverly silt loam	No. 13, Holly silt loam	No. 10, Eel silty clay loam	No. 2, Genesee silty clay loam	No. 9, Genesee silt loam	No. 3, Genesee fine sandy loam	No. 17, Sharkey silt loam	No. 18, Sharkey silty clay loam	No. 19, Sharkey silty clay
Phosphorus [1]	1,223	1,049	2,010	2,097	2,010	961	1,398	1,835	2,185
Potassium [1]	1,177	2,186	3,363	5,045	3,027	1,177	1,850	4,372	4,708
Calcium [1]	6,857	7,000	12,143	11,143	10,143	8,286	5,714	10,714	15,429
Magnesium [1]	4,825	4,104	7,841	8,203	6,635	4,584	3,860	6,031	6,393
Manganese [1]	140	140	140	140	1,150	140	580	290	580
Iron [1]	36,052	17,230	46,312	58,710	49,162	21,517	25,792	43,605	54,862
Aluminum [1]	34,575	37,651	63,212	47,939	28,742	15,803	37,863	56,318	81,030
Sulphur [1]	644	561	962	962	962	644	561	644	561
Phosphorus [2]	68	77	175	180	192	201	77	157	122
Potassium [2]	151	50	235	235	168	42	67	219	168
Nitrogen [3]	2,000	1,800	2,800	4,000	3,000	1,000	2,400	3,400	4,800
Potassium [3]	21,019	24,550	28,250	25,899	27,745	13,956	16,983	18,833	17,824

[1] Soluble in strong hydrochloric acid (sp. gr. 1.115).
[2] Soluble in weak nitric acid (fifth-normal).
[3] Total elements.

Three groups of analyses are given; elements soluble in strong (specific gravity 1.115) hydrochloric acid, elements soluble in weak (fifth-normal) nitric acid, and total plant-food elements.

The total content of the plant-food elements is more valuable in indicating the origin of a soil than its fertility. This is particularly true with respect to potassium. The quantity of total potassium in a soil can seldom be used as an index of its need for potash fertilizer. Some Indiana soils have over 30,000 pounds of total potassium per acre in the surface 6 inches, yet fail to grow corn successfully without potash fertilization, because so little of the potassium they contain is available.

A low total nitrogen content is generally indicative of the need of a soil for nitrogen, although a soil with a low content of total nitrogen may have a supply of available nitrogen sufficient to grow a few large crops without the addition of nitrogen. Soils of low total nitrogen content soon become exhausted so far as that element is concerned unless the supply of this element is replenished by legumes used as green manure, or by the use of nitrogenous fertilizers.

The quantity of total phosphorus in an ordinary soil is usually about the same as that shown by a determination made with strong

acid. For this reason a separate determination of total phosphorus has been omitted. A low supply of total phosphorus usually indicates the need of a soil for phosphate fertilization, although there are exceptions to this.

The quantity of phosphorus soluble in weak acid is considered by many authorities as a very good indication of the phosphorus needs of a soil. Few soils with over 100 pounds of phosphorus soluble in weak acid respond to phosphate fertilization. Whenever the phosphorus runs less than 50 pounds per acre, phosphates are needed in liberal quantities.

The quantity of potassium soluble in strong or weak acid is to some extent significant. This determination, however, is not so reliable an indicator as the determination of phosphorus, particularly with soils having a high content of lime.

The use of strong or weak acid in the analysis of a soil has sometimes been criticized as having little practical value, yet analyses made with strong or weak acids more often can be correlated with crop production than can analyses of the total elements. For this reason acid solutions have been employed in these analyses.

It must be admitted that no one method of soil analysis can definitely indicate the deficiencies of a soil, but it is believed that, by taking into consideration all the analyses, the data shown in the foregoing table are indicative of the general fertility of the different soils.

The nitrogen, phosphorus, and potassium contents of a soil are by no means the only chemical indications of a high or low degree of productivity. One of the most important factors in soil fertility is that of acidity. Soils which are very acid will not produce highest yields even when there is no lack of the plant-food elements. Nitrogen, phosphorus, and potassium can not become most effective in crop production when a soil is deficient in lime. The following table shows the percentage of volatile matter and nitrogen, and the acidity of the various soils found in the county, expressed in terms of pounds of limestone required per acre. Samples were taken from the surface soil (0 to 6 inches), from the subsurface (6 to 18 inches), and from the subsoil (18 to 36 inches). It is important to know the reaction, not only of the surface but also of the lower layers of the soil.

Volatile matter, nitrogen, and acidity of Clay County soils

Sample No.	Soil type	Depth	Volatile matter	Nitrogen	Acidity[1] (limestone required per acre)
		Inches	*Per cent*	*Per cent*	*Pounds*
15.1	Vigo silt loam	0 to 6	3.73	0.13	520
		6 to 18	3.15	.09	3,540
		18 to 36	3.54	.05	6,720
7	Vigo fine sandy loam	0 to 6	1.88	.06	370
		6 to 18	1.02	.03	530
		18 to 36	.81	.04	2,360
14.1	Gibson silt loam	0 to 6	3.30	.10	1,500
		6 to 18	2.82	.06	6,540
		18 to 36	3.16	.04	8,680
20	Parke silt loam	0 to 6	4.07	.12	120
		6 to 18	3.25	.08	340
		18 to 36	3.32	.05	4,140

[1] Hopkins's method.

Volatile matter, nitrogen, and acidity of Clay County soils—Continued

Sample No.	Soil type	Depth	Volatile matter	Nitrogen	Acidity (limestone required per acre)
		Inches	*Per cent*	*Per cent*	*Pounds*
4	Princeton fine sandy loam	0 to 6	2.65	.09	150
		6 to 18	1.96	.06	280
		18 to 36	2.50	.06	4,590
5	Princeton fine sand	0 to 6	1.86	.08	190
		6 to 18	1.01	.04	30
		18 to 36	.84	.03	20
11	Cory silt loam	0 to 6	5.54	.17	200
		6 to 18	4.14	.12	280
		18 to 36	3.40	.04	240
6	Cory fine sandy loam	0 to 6	2.74	.10	50
		6 to 18	1.68	.05	10
		18 to 36	2 97	06	20
1	Waverly silt loam	0 to 6	3.40	.10	1,910
		6 to 18	3.02	.06	6,530
		18 to 36	3.22	.06	3,100
13	Holly silt loam	0 to 6	3.70	.09	40
		6 to 18	2.93	.06	80
		18 to 36	2.11	.05	2,770
10	Eel silty clay loam	0 to 6	5.57	.14	20
		6 to 18	5.04	.11	40
		18 to 36	4.83	.09	0
2	Genesee silty clay loam	0 to 6	6.09	.20	30
		6 to 18	5.81	.17	40
		18 to 36	5.52	.17	20
9	Genesee silt loam	0 to 6	4.90	.16	0
		6 to 18	3.85	.11	0
		18 to 36	3.00	.09	20
3	Genesee fine sandy loam	0 to 6	1.65	.05	50
		6 to 18	2.14	.08	20
		18 to 36	1.28	.06	20
17	Sharkey silt loam	0 to 6	3.89	.12	320
		6 to 18	3.75	.10	390
		18 to 36	3.29	.08	230
18	Sharkey silty clay loam	0 to 6	6.17	.17	40
		6 to 18	5.17	.14	100
		18 to 36	3.98	.07	70
19	Sharkey silty clay	0 to 6	8.25	.24	260
		6 to 18	7.28	.20	190
		18 to 36	5.90	.13	120

There are two general groups of soils in Clay County—the upland soils and the bottom-land soils which are located along the creeks and river. As a rule, the upland soils are acid and contain less phosphorus than the bottom-land soils. The bottom-land soils contain more organic matter and nitrogen, particularly in the subsurface, than do the upland soils. The Cory soils, although upland soils, are exceptions, being less acid and more fertile than the other upland soils. This is probably owing to the fact that they are prairie and not timber soils. The Waverly silt loam is the only bottom-land soil which is very acid and in need of lime. This soil is naturally shallow and less fertile than the other bottom-land soils.

As a general rule, a soil which is only slightly acid or neutral in reaction and in which the organic matter and nitrogen extend deeply into the subsurface will be more fertile than a shallow, acid soil. Given two soils of the same acidity on the surface, the soil with greater acidity in the subsurface needs lime much more than one in which the subsurface is less acid than the surface. Also, the more organic matter and nitrogen a soil contains the less it needs lime, as compared with a soil of similar acidity, but having a low content of organic matter.

In interpreting the soil survey map and analyses it should be borne in mind that a well-farmed, well-fertilized, and manured soil, naturally low in fertility may produce larger crops than a poorly farmed soil naturally high in fertility. The better types of soils will endure exhaustive cropping much longer than the less fertile types.

SOIL MANAGEMENT

For convenience in discussing soil management, the several soils of the county are grouped according to certain important characteristics with respect to their needs or improvement. For example, several of the light-colored upland types, having practically the same content of organic matter and plant-food requirements, may be conveniently discussed together, thus avoiding much repetition that would be necessary if each were discussed separately. Where different treatments are required by particular soils within any group, they are specifically pointed out. The reader should study the group including the soils in which he is particularly interested.

LIGHT-COLORED UPLAND SILT LOAMS

Light-colored upland silt loams include the Gibson, Vigo, and Parke silt loams. They are all naturally deficient in phosphorus, nitrogen, and organic matter. With the exception of some areas of Parke silt loam, these soils are also more or less in need of liming. In some cases potash is also needed. All of the Vigo silt loam and a considerable portion of the Gibson silt loam should have tile drainage.

Drainage.—The first step in improving the Vigo silt loam is thorough tile drainage. Without tile this land can not be satisfactorily managed, and no other soil treatment can produce its full effect. Experience on experiment fields on similar soils indicates that tile lines laid not more than 3 rods apart and 30 inches deep will give excellent results. Where the land is very flat great care must be exercised in tiling, to obtain an even grade and uniform fall. No grade lines should be established by guess or by any rule-of-thumb method. Nothing less accurate than a surveyor's instrument should be used, and all proposed lines of tile should be accurately staked and graded before any ditching is done, to make sure that all the water will flow to the outlet without interruption or slackening of the current. The rate of fall may be increased toward the outlet, but it should never be lessened. Checking of the current may cause the tile to fill with silt, and this will choke it. Several unsatisfactory experiences in tiling Vigo silt loam have been reported. Such failures are due to improper grading of the tile lines, sags in the lines, causing the tile to fill with silt. This soil is very silty and will drain readily enough if the tile lines are properly constructed. It is an excellent plan before filling the ditches to cover the tile with a few inches of straw, weeds, or grass cut from the field. This will prevent silt washing into the tile at the joints while the ground is settling, insuring perfect operation of the tile from the beginning.

The Gibson silt loam has better surface drainage than the Vigo silt loam, and it also has a tight subsoil which permits little natural

underdrainage. Wherever possible, therefore, this type of soil should be tiled about the same as the Vigo silt loam. Most of the Parke silt loam has considerably better natural underdrainage, and hence is not so much in need of tiling.

Liming.—The Vigo and Gibson silt loams are the most acid upland soils in the county; hence they should be thoroughly limed before other treatments can produce the best results. Liming should therefore be one of the first treatments. At least 1 or 2 tons of ground limestone will be required as a first application; after that a ton per acre every second or third round of the rotation may keep the soil reasonably well supplied with lime. Experiments on similar soils in other parts of the State have shown large profits from liming. Only about half of the Parke silt loam is in need of liming. Whenever clover fails to do well, the soil should be tested for acidity, and limed if necessary.

Organic matter and nitrogen.—All of these light-colored soils are naturally low in organic matter and nitrogen, and continuous cropping without adequate use of organic manures or return of crop residues has made matters worse.

There is only one practical way to remedy this condition, and that is to plow under more organic matter than is used in crop production, using legumes in sufficient quantities to supply the needed nitrogen. To do this satisfactorily, the land must be put in condition to grow clover and other legumes. This means liming whenever the soil is acid, and also the application of soluble phosphates. After liming, at least 200 or 300 pounds per acre of acid phosphate should be applied. Wet lands must also be drained. Clover or some other legume should appear in the rotation every two or three years. As much manure as possible should be made from the produce fed, and all produce not fed, such as cornstalks, straw, and cover crops, should be plowed under. It must be remembered that legumes are the only crops that can add appreciable quantities of nitrogen to the soil, and then only as the top growth is plowed under or is fed and the manure applied to the land. Cover crops should be grown whenever possible, to supply additional material for plowing under. Planting soy beans with the corn or seeding rye in the fall on cornland that is to be plowed the following spring are good practices to increase the quantity of organic matter for plowing under.

Crop rotation.—With tile drainage, liming, and proper fertilization these soils will produce satisfactorily all the ordinary farm crops grown in Clay County. On account of the shortage of organic matter and nitrogen, however, every system of cropping should include clover or some other legume, to be returned to the land in one form or another. Corn, soy beans, wheat, and clover, grown in the order named, is an excellent rotation for these soils. Oats are not adapted to the climatic conditions, and as a rule should be omitted. Soy beans are not only worth more as a crop than oats, but the crop is also better for the wheat which follows. If more corn is wanted, the rotation may be lengthened to five years by growing two corn crops in succession. This may be done by adding a little more fertilizer. Timothy is not usually a profitable crop; but if timothy is wanted it may be mixed with the clover and the seeding be allowed to stand a year longer.

Fertilization.—In the table showing the chemical composition of the soils of the county it may be seen that these light-colored soils are low in phosphorus and nitrogen. The total potassium in these soils is large, but the quantity available to crops is comparatively small, so that the supply may need replenishing. The problem of supplying nitrogen has been discussed in connection with the suggestions for supplying organic matter. Legumes and manure are the logical and only really practical means of supplying the bulk of the nitrogen needed, and should be largely relied upon for this purpose. Thus, livestock farming with plenty of legumes included in the crop rotations is best on these soils. Such a system will largely take care of the nitrogen supplies for the grain crops. However, it will pay in most cases to have some nitrogen in the fertilizer used for wheat, regardless of its place in the rotation. Even where wheat follows soy beans or cowpeas it should receive some fertilizer nitrogen because the nitrogen in the legume residues does not become available quickly enough to be of much help to the wheat in the fall. The material must first decay, and this does not take place to any considerable extent until the following spring.

Phosphorus is the mineral plant-food element most deficient in all of these soils. There is only one way to supply this, and that is by the use of phosphatic fertilizers. The natural supplies of phosphorus in these soils should not be further drawn upon, since they are already too low. Provision should therefore be made to supply, from outside sources, all the phosphorus needed by the crops grown. In rotations of ordinary crops producing reasonable yields it may be counted that 20 pounds of phosphoric acid per acre per year is required. This can be supplied by applying an average of 125 pounds of 16 per cent acid phosphate, or its equivalent in some other soluble phosphate, per acre per year. This may be applied all at once or at various times during the rotation. Where manure is used, it may be counted that each ton supplies 5 pounds of phosphoric acid; so that where manure is used, less phosphate fertilizer is required in the rotation.

The quantity of potash that should be applied as fertilizer will depend on the general condition of the soil and the quantity of manure used. The chemical analyses of these soils show that the available potassium is too low for maximum crops, so that some potash should be used until more manure becomes available for use or until the general condition of the soil is materially improved. There is plenty of potassium in these soils to last a long time if it could only be made available. Its availability may be materially increased by proper tillage, drainage, the growing of legumes, and the incorporation of liberal quantities of organic matter. The better these practices are followed and the more manure that is used, the less potash fertilizer will have to be purchased.

LIGHT-COLORED SANDY UPLAND SOILS

The light-colored sandy upland soils include the Princeton fine sandy loam, Princeton fine sand, and Vigo fine sandy loam. These soils are naturally deficient in organic matter and all three of the major nutrient elements—nitrogen, phosphorus, and potassium.

They are also generally acid and are in need of lime. With the exception of some areas of Vigo fine sandy loam, these soils are well drained. In the Princeton soils the drainage is generally excessive, and crops on many areas suffer from drought. Thus the soils in many places need to have their water-holding capacity increased. This can be done by increasing the soil content of organic matter.

Liming.—The Vigo fine sandy loam is the most acid soil in this group, and practically all of it should be limed. One or two tons of ground limestone per acre, or the equivalent in some other form of lime, will usually be sufficient to begin with. After that a ton of limestone every two or three rounds of the rotation may keep the land sufficiently supplied with lime.

The Princeton fine sand and Princeton fine sandy loam are often in need of lime, but not so much as the Vigo fine sandy loam. Wherever clover fails to grow well the soil should be tested for acidity and limed according to the indicated needs.

Organic matter and nitrogen.—The chemical analyses of these sandy soils show them to be very low in both organic matter and nitrogen. Some special provision must be made for increasing both of these constituents before their productiveness can be materially increased. As much manure as possible should be made and plowed under along with all unused crop materials, such as cornstalks and straw. Special green-manure crops and cover crops should be planted wherever possible for plowing under, including such crops as soy beans, cowpeas, rye, and winter vetch. Seeding rye and vetch in the standing corn for plowing under the following spring may often prove practicable. The leguminous crops—soy beans, cowpeas, and vetch—will be most valuable for plowing under, because they add considerable quantities of nitrogen as well as organic matter. The growing of clover and other legumes, either for green manure or for forage, is the only practical means of supplying these soils with nitrogen in any appreciable quantities. Only small quantities of commercial nitrogen can be used at a profit on the grain crops, and even truck crops should have the bulk of their nitrogen supplied by means of legumes.

Crop rotation—Although grain crops are principally grown on these soils, they are well adapted to various truck crops which are partial to soils of a sandy nature. Corn and grass are least adapted to these soils wherever they are apt to be droughty, and should be avoided as much as possible. Soy beans, cowpeas, alfalfa, and clover are much better for these lands and should be more extensively grown. Most of these soils will produce excellent alfalfa after they are limed and fertilized with reasonable quantities of phosphate and potash. The areas least adapted to corn should be permanently laid down to alfalfa, except where they can be more profitably used for truck crops. On the less droughty areas a four-year rotation of corn, soy beans or cowpeas, wheat or rye, and clover may be successfully practiced, provided attention be given to proper fertilization. A legume every other year is especially desirable on these soils in order to increase their nitrogen content.

Fertilization.—By growing legumes, by feeding as much of the produce as possible for the production of manure, and by utilizing unused residues and an occasional cover crop the nitrogen needs of

the small-grain crop at least can be taken care of, excepting wheat and rye, which should receive small quantities of commercial nitrogen. Even where either one of these two crops follows a legume it will pay to use a fertilizer containing some nitrogen, such as a 2–12–4 or a 2–12–6. Truck crops will usually yield a profit on larger applications of commercial nitrogen.

The natural reserves of phosphorus in these soils should not be further drawn upon, since these reserves are already too low. Sufficient phosphorus should be applied in fertilizer and manure to meet the entire needs of the crops.

In the table showing the chemical analyses of these soils it may be observed they are all very low in soluble potassium. This means that even where most of the produce is fed and the manure is applied to the land a considerable quantity of potash fertilizer should be used. The complete fertilizers used should contain half as much potash as phosphoric acid, as in a 2–12–6. Where manure is scarce, 200 pounds of an 0–12–12 fertilizer should be broadcast for corn; and later 100 pounds of a 2–12–6 fertilizer should be applied in the drill row at the time of planting. The wheat or rye in the rotation should always receive about 200 pounds of a 2–12–6 mixture per acre. For truck crops the rate of fertilization should be considerably heavier.

DARK-COLORED UPLAND SOILS

The Cory silt loam and Cory fine sandy loam are the only dark-colored upland soils mapped in Clay County. Cory silt loam is reasonably well supplied with organic matter and nitrogen, but the soil should be so managed as to maintain these reserves. By growing a reasonable proportion of legumes and by returning the manure these important soil constituents can be maintained to the extent that not much fertilizer nitrogen need to be purchased. Wheat, however, should receive a high-grade complete fertilizer. Cory fine sandy loam shows much more limited reserves of organic matter and nitrogen, and for this reason legumes should be given more prominence in the cropping system.

Drainage.—The Cory silt loam requires about as much tile drainage as the Vigo silt loam with which it is associated. Much of the Cory fine sandy loam also needs tiling, because of its low location.

Liming.—Some areas of the Cory silt loam will respond profitably to liming. Where clover does not do well after proper drainage the soil should be tested for acidity and limed accordingly. The fine sandy loam apparently does not need lime, except for crops which are very sensitive to acid conditions, such as alfalfa.

Crop rotation.—When properly drained the Cory silt loam is the most productive upland soil in the county, and will produce all of the crops adapted to this locality. Corn, wheat, and clover, or corn, soy beans, wheat, and clover are good rotations for general farming. Cory fine sandy loam when well drained will also produce good yields of the truck crops adapted to the sandy soils.

Fertilization.—With a reasonable use of legumes in the crop rotation the nitrogen needs of the ordinary crops can be largely taken care of on these soils; and if some manure is used nitrogen need not be purchased, except for truck crops and perhaps a little for wheat.

Phosphatic fertilizers should be used in considerable quantities. The average crop yields on these soils are not nearly what they should be, the lack of sufficient available phosphorus being one of the principal reasons. Enough fertilizer should be used somewhere in each rotation to supply an average of from 15 to 20 pounds of phosphoric acid per acre per year, depending on the quantity of manure used.

The available supplies of potassium are also limited, so that it will pay to apply fertilizers containing about half as much as of phosphoric acid.

LIGHT-COLORED BOTTOM LANDS

The Waverly silt loam and Holly silt loam are the light-colored bottom-land soils mapped in Clay County. They are naturally wet and heavy, strongly acid and deficient in organic matter, nitrogen, phosphorus, and available potassium. In their improvement, therefore, attention must be given to drainage, liming, the incorporation of more organic matter, the growth of legumes, and to the use of considerable quantities of fertilizer.

Drainage.—All of the Waverly silt loam should have tile drainage whenever suitable outlets can be provided, so that the surplus water in the soil may get away more readily, especially at times when no interference is offered by floods or high water in the streams. Tile lines should be laid about 40 feet apart and 30 inches deep. The precautions suggested in discussing the drainage of the Vigo silt loam should be carefully observed in tiling this kind of land in order to get satisfactory results.

Liming.—The Waverly silt loam is the most acid type of soil in the county. Thorough liming should, therefore, be one of the first steps in its improvement. It should receive from 2 to 3 tons of ground limestone per acre, or its equivalent in some other form of lime, as a first application. After that, 1 or 2 tons per acre every five or six years will keep this land in good condition.

Organic matter and nitrogen.—What has been said about supplying organic matter and nitrogen to the light-colored upland silt loams applies equally well to the Waverly silt loam. This soil is decidedly lacking in both of these soil constituents, and in order to increase them, more organic matter than is removed in cropping must be plowed under, either as green manure or as barnyard manure. Furthermore legumes should be grown and largely returned to the land to increase its nitrogen content.

Where the land is periodically flooded, clover and other deep-rooted legumes, especially biennials and perennials, can not be depended upon; but certain shallow-rooted legumes, like alsike clover, soy beans, and cowpeas, can be satisfactorily grown instead. These legumes should be largely used for gathering nitrogen from the air, which they will do in a large measure when properly inoculated. Here, again, it must be remembered that only the top growth plowed under, either as green manure or in the form of barnyard manure, will really increase the nitrogen content of the soil. Cover crops should be grown whenever possible, such as cowpeas, soy beans, or rye in cornfields.

Crop rotation.—Where overflowing can not be prevented the crop rotation should consist largely of annual, spring-seeded crops, including such grass-and-clover mixtures as will not be seriously injured by ordinary floods. On most of the Waverly silt loam wheat is not a safe crop, because of overflows, and red clover, likewise, can not be depended upon. For the most part, corn, soy beans, oats, or wheat, followed by alsike clover and timothy mixed will make a satisfactory rotation. With proper fertilization the rotation may be lengthened a year by growing two crops of corn in succession. The second crop of corn may follow the soy beans. Timothy and alsike grow better on this land after it is limed, so that under such improved conditions the meadow may be allowed to stand for two or three years. For late seeding in emergencies, early varieties of soy beans and Sudan grass for either hay or seed may be found useful.

Fertilization.—After the land is limed most of the nitrogen required can be provided by growing legumes and by using the manure produced in the feeding of the legume hay. Thus legumes should be included in all rotations. Where wheat is grown, however, some nitrogen should be used in the fertilizer to give it a proper start.

Soluble phosphates should be used in quantities sufficient to meet the phosphorus needs of maximum crops, since the soil reserve of phosphorus, already deficient, should not be further reduced.

The total quantity of potassium in the soil is large, but its availability is very low; so that more or less potash fertilizer should be used, the rate of application depending on the extent to which manure and crop residues are utilized in soil improvement.

As a general rule, wheat should receive 200 pounds per acre of a 2–12–4 or a 2–12–6 fertilizer, and the corn should receive from 200 to 300 pounds of acid phosphate broadcast before planting and 100 pounds of a 0–12–6 mixture applied in the drill row with the corn. Where little manure is used, some potash should also be included in the fertilizer which is broadcast for corn. Timothy meadows may be materially helped by broadcasting 100 pounds of nitrate of soda per acre after growth is well under way, in April.

DARK-COLORED BOTTOM LANDS

Dark-colored bottom lands include the soils of the Genesee, Eel, and Sharkey series, which vary in color from grayish brown to black, depending on the content of organic matter.

The greatest problems in the management of these soils are to provide adequate drainage and to prevent damage from flooding, although considerable areas are high enough to escape all ordinary floods. Tile drainage should be provided wherever suitable outlets can be provided.

The soils of this group are reasonably well supplied with lime, except the Sharkey silt loam, which may need lime in order that clover may be grown satisfactorily.

All of these soils are well adapted to corn; but wherever drainage is satisfactory, more or less wheat and clover should be included in the rotation. Soy beans may often be used to advantage. The higher, better-drained areas will produce good alfalfa and certain truck crops.

Most of these soils are fairly well supplied with organic matter, and with reasonable care in soil management their nitrogen supplies can be satisfactorily maintained. Most of the Genesee fine sandy loam, however, needs to have its organic matter and nitrogen supplies increased. For this reason legumes and cover crops for plowing under should be grown as much as possible. The soil on these areas referred to will also respond to some phosphate and potash fertilizer. Of the heavier soils, only some are in need of fertilizer. When crop yields are not satisfactory, some acid phosphate should be used. In some cases a little potash will also pay.

The small areas of muck should be liberally fertilized with potash, and occasionally some phosphate should be added.

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE
PURDUE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION

SOIL MAP

INDIANA
CLAY COUNTY SHEET

LEGEND
Cory fine sandy loam
Parke silt loam
Cory silt loam
Princeton fine sand
Eel silt loam
Princeton fine sandy loam
Eel silty clay loam
Sharkey silt loam
Genesee fine sandy loam
Sharkey silty clay loam
Genesee silt loam
Sharkey silty clay
Genesee silty clay loam
Vigo fine sandy loam
Gibson silt loam
Vigo silt loam
Eroded phase
Waverly silt loam
Holly silt loam
Mine dumps
CONVENTIONAL SIGNS
CULTURE
(Printed in black)
City or Village, Roads, Buildings Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
Secondary roads and Trails
Railroads, Steam and Electric
Bridges, Ferry
R.R. crossings, Tunnel
Ford, Dam
School or Church, Cemeteries
Mine or Quarry, Mine dumps, Made land
Bluff, Escarpment, Rock outcrop and Triangulation station
Stony and Gravelly areas
Soil boundaries
Boundary lines
Boundary lines
Boundary lines
U.S. township and section lines
RELIEF
(Printed in brown or black)
Contours, Depression contours
Prominent Hills, Mountain Peaks
Sand Wash and Sand dunes
Shore and Low-water line, Sandbar
DRAINAGE
(Printed in blue)
Streams
Lakes, Ponds, Intermittent lakes
Intermittent streams
Springs, Canals and Ditches, Flumes
Swamp, Salt marshes
Submerged marsh, Tidal flats
The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.
R. 7 W.
R. 6 W.
R. 5 W.
T. 13 N.
T. 12 N.
T. 11 N.
T. 10 N.
T. 9 N.
PARKE CO.
CLAY CO.
PUTNAM CO.
OWEN CO.
VIGO CO.
SULLIVAN CO.
GREENE CO.
DICK
JOHNSON
VAN BUREN
BRAZIL
POSEY
JACKSON
CASS
SUGAR RIDGE
WASHINGTON
PERRY
HARRISON
LEWIS
Carbon
Brazil
Harmony
Knightsville
Staunton
Centerpoint
Bowling Green
Saline City
Clay City
Coalmont
Poland

Soils surveyed by Grove B. Jones, in charge, and C. B. Manifold of the U. S. Department of Agriculture, and T. M. Bushnell and R. P. Oyler of the Purdue University Agricultural Experiment Station.

Scale $\frac{1}{62500}$

Contour interval 20 feet.
Datum is mean sea level.

BASE MAP IN PART FROM
U. S. GEOLOGICAL SURVEY SHEETS

A. Hoen & Co. Lith. Baltimore, Md.

Field Operations
Bureau of Soils
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